ABEL JANSZOON TASMAN:

HIS LIFE AND VOYAGES.

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BY

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PREFACE.

No life of the first circumnavigator of Australia has hitherto appeared in English. Nothing has been accessible to the English reader but an abstract of one voyage and a few lines in biographical dictionaries. This is scarcely surprising, when we consider how careless Tasman's own countrymen have been of his fame. Fifty years ago all that had been printed in his own country consisted of short abstracts of a few voyages, and these were hidden away in bulky collections. Even the date and place of his birth were matter for conjecture and dispute. Things are somewhat better now. Thirty-five years ago the complete journal of his famous voyage of 1642 was published in Holland, and we are now promised a sumptuous *fac simile* edition of the original manuscript, with notes by two eminent scholars, and with an English translation.

Moreover, patient searchers in the Dutch Colonial Archives have for years past been laboriously gleaning scattered particulars respecting him, and the results of their investigations have been printed from time to time in the transactions of Dutch learned societies, and in other places. It has thus become possible to piece together a fairly connected account of the great navigator's life.

But after all available information has been made use of, the result is disappointing. The man himself remains for the most part an indistinct figure. Personal details are few. The facts are mostly dry and meagre, gathered from formal official despatches and dusty registers. The material is wanting for a biography which would give a clear and sharply defined picture of the man as he lived.

It is possible, however, to attain what is of even more interest. We can arrive at a just estimate of his work as a discoverer, and of his place among the great navigators of the

world. The discovery of Tasmania and New Zealand was no chance adventure. It was the result of a steady policy. It was the outcome of the adventurous energy which in the 16th and 17th centuries created the Dutch Republic; gave to Holland her Colonial Empire; and—not content with her possession of the Eastern Archipelago—sent out her sailors to search for a new world in the unknown regions of the mysterious South. Tasman and Visscher are but types of the men who won for their country her once proud position of mistress of the seas.

In the following pages an attempt has been made not merely to give all that is known of Tasman's life and work, but to present that work in proper historical perspective.

I desire to acknowledge generally my obligation to the authors whose names appear in the list appended to this paper, particularly to Messrs. Dozy, Heeres, Van Boekeren, and Leupe. Also to Sir Edward Braddon for his courtesy in having, when Agent-General for Tasmania, obtained for me valuable information from Holland. Especially to Mr. J. E. Heeres, of the Dutch State Archives at The Hague, for his generous kindness in placing at my disposal manuscript notes of his researches in the old Colonial Records—notes containing interesting details which have never before appeared in print. And, lastly, to the Treasurer, Sir Philip Fysh, for authorising the printing of this paper at the Government Press of the Colony. It is fitting that the first English biography of Tasman should be offered to Australian readers by the country which he discovered and which bears his name.

JAMES B. WALKER.

Hobart, January, 1896.

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(From the Atlas of Janssonius ; Amsterdam, circa 1630.) Shows the Terra Australis Nondum Cognita, as supposed before Tasman's discoveries. [See page 19 of the text.] The figures in the border of the map represent : (1) The Seven Planets. (2) The Seven Wonders of the World. (3) The Four Elements. (4) The Four Seasons.

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(Reduced from the *fac simile* in Mr. Jacob Swart's edition of the Journal of 1642 ; Amsterdam, 1860.) The original map—which is elaborately coloured—is probably the work of the Pilot-Major Frans Visscher. [See Bibliographical Notes ; Manuscript Maps, No. 1, page 44.]

MAP OF ANTHONY VAN DIEMENSLANDT 49

(From Messrs. F. Muller and Co.'s reproduction of the map in Tasman's Journal.) The original map—which is carefully coloured—is contained in the Manuscript Journal preserved in the State Archives at The Hague, and described in the Bibliographical Notes as R.A. 2. [See page 45.]

INTRODUCTION.

THE modern era of maritime discovery may be said to begin with the work of Prince Henry of Portugal, surnamed "The Navigator" (1394–1460). Prince Henry devoted his life to the furtherance of geographical discovery. He was inspired by the hope of finding the sea-route to the East, and winning for his country the rich trade of India and Cathay. During forty years he sent out from Lagos fleet after fleet bound for the exploration of the coasts of Africa. Further and further south into the unknown and dreaded Atlantic his caravels pushed their way, until at his death, in 1460, his captains had reached the mouth of the Gambia beyond Cape Verde, and had colonised the Azores. The discoveries made under this Prince's inspiring influence were the stepping-stone to the great voyages which marked the close of the century. Following the initiative of Henry, the bold genius of Columbus conceived the splendid idea of finding the East by sailing west; and, in 1492, when he fell upon America, he believed that he had reached the further shores of India. Five years later Henry's countryman, Vasco da Gama, in a voyage almost as important as that of Columbus, doubled the Cape of Good Hope, and opened the gates of the sea-way to Calicut and the East. Pope Alexander the Sixth by his famous Bull apportioned the world between the discoverers—allotting the western half to Spain, and the eastern to Portugal. From that time the gold and silver of the West were poured into the lap of Spain; while Portugal gathered in as her sole property the rich profits of the coveted trade of the East. For well nigh a century the two nations enjoyed a practical monopoly of the regions which the daring of their sailors had won. Spain, in particular, through the wealth she acquired from her American possessions, became the dominant power in the world, and the mistress of the sea. Her fall from that high eminence was due to her arrogant greed for universal dominion, and her attempt to crush a free nation of traders.

In the 15th and 16th centuries the Netherlands—the Low Countries of common English parlance—were the most prosperous nation in Europe. While other nations exhausted themselves in war, they devoted themselves to the arts of peace. In agriculture they were far in advance of all other countries of the time. The Flemish weavers were the first in

the world, and their looms supplied England and all Europe with the best linen and woollen fabrics. In an age when salted provisions were almost the sole winter diet of all classes, the fisheries of the North Sea were nearly as important as the manufactures of Flanders. These fisheries were well nigh monopolised by the Hollanders, and were a rich mine of wealth to the northern towns, while they trained a hardy and daring race of sailors. In addition to their manufactures and their fisheries, the Dutch had become the traders and carriers of the European world. It was Dutch ships and Dutch sailors that distributed throughout Europe the treasures brought by Spanish and Portuguese fleets from the East and West Indies.

The Netherlands were an appanage of the Spanish crown. But the rich manufacturing and trading cities of Flanders and Holland enjoyed considerable liberties and powers of local self-government, granted to them from time to time by their over-lords in exchange for heavy annual payments. It was the attempt of the Spanish king Philip the Second to abolish the charters of their towns, to stamp out their liberties, and to suppress the Reformed Religion by means of the Inquisition, that led to the rise of the Dutch Republic, and the long and cruel war with the revolted Provinces, which lasted eighty years (1566-1648), and finally resulted in the humiliation of Spain.

The Dutch revolt forms one of the most striking epochs in history. It was the first blow struck in modern times for human freedom and liberty of conscience against the despotism of kings and the intolerance of priests. The power of the strongest empire in the world was put forth to crush the revolted citizens. Treachery, torture, and massacre were freely and ruthlessly employed. The butcheries of the Duke of Alva still stand out pre-eminent in the bloody annals of tyranny and persecution. The story, as we read it in the graphic pages of Motley, bristles with deeds of ferocious cruelty and blood.

The struggle would have been hopeless, but that their extremity taught the Dutch to find their strength upon the sea. Powerless before their enemies on land, the patriots took to the ocean. In small vessels their hardy sailors cut off the Spanish supplies, made daring descents on sea-coast towns, and in process of time set themselves to work to strike Spain in her most vulnerable part, her commerce with the New World, from which she drew her wealth. The Beggars of the Sea, as the Dutch rovers styled themselves, became the terror of the richly laden galleons and haughty fleets of Spain. Not only did they cut off the supplies of gold and silver from the New World on which the Spanish King depended,

but in the spoils which they wrested from the enemy and in the trade which they were continually extending they found the means for their country to carry on the conflict. England, almost equally in danger from Spanish designs, made common cause against the enemy. Even when the countries were not at open war, Drake and the English seamen acknowledged no peace with Spain beyond the Line, but captured her ships and sacked her settlements on the Spanish Main, returning home laden with treasure. Foiled in his disastrous attempt to conquer England with his Great Armada, Philip was equally unsuccessful in his efforts to destroy the Dutch commerce. In vain did he prohibit the Hollanders from trading with his dominions. In vain did he from time to time lay embargoes on their ships, and send thousands of their sailors to languish in the dungeons of the Inquisition. The bold Hollanders only replied by vigorous reprisals. They mocked at his prohibitions, and continued to carry on an ever increasing and enormously profitable illicit trade. Dutch and English privateers triumphantly swept the seas and harried the Spaniards at their pleasure. Subjugated Flanders had become an obedient Spanish province; her rich merchants had fled, and her people were starving in a desolated country. But the unconquered United Provinces of the north were actually profiting by the war, and every day growing richer and more powerful.

The long struggle on the seas, and its successful issue, roused both in England and Holland an insatiable spirit of adventure. In England this spirit found its outlet in privateering or piratical exploits, such as those of Hawkins and Drake; or in romantic expeditions, such as that of Raleigh to Guiana; and led, in its ultimate development, to the establishment of our Colonial and Indian Empire.

In Holland the adventurous spirit received a strong stimulus from the blind and stupid policy of the Spanish king. For a hundred years—ever since the discovery of the Cape route to the East Indies—Lisbon had been the great centre of the eastern trade. It was thither the Dutch traders came to bring wheat, fish, and other products of Northern Europe, and to carry away in return and distribute the spices and merchandise of the East. In 1594 Philip—who had some time before acquired the crown of Portugal—closed the port of Lisbon, and prohibited Dutch and English ships, even under a neutral flag, from trading with any part of his empire. The blow not only failed of its effect, but recoiled on the striker. It ruined Lisbon; crippled Spain; and made the Dutch East Indian Empire. With a sagacious daring the Hollanders immediately formed the steady resolve to find these eastern

treasures for themselves, and wrest the trade from their enemies.

Their first attempt to reach the Indies was discouraging. It was a favourite idea in those days that a short and practicable route to China and India could be found by the north-east passage round the north of Europe. To find this passage and take the Portuguese in the rear was the object of the first Dutch enterprise. The expedition proved disastrous, getting no further than Nova Zembla. Two subsequent expeditions in the same direction met with no better fate.

Baffled in their efforts to find a passage through the frozen seas of the North, the Dutch turned their attention to the old route round the Cape. The merchants of Amsterdam formed a company, under the quaint name of "The Company of Far Lands," and fitted out four vessels, the largest 400 tons, and the smallest only 30 tons burden. The little fleet sailed from the Texel 2nd April, 1595. After a fifteen months' voyage it reached Java, and laid the foundation of the Dutch eastern trade. From this time numerous new companies were formed in Holland: every year fresh fleets left for the east, many of them returning with rich cargoes, and making enormous profits. In spite of the violent attacks of the Spaniards and Portuguese, the Dutch steadily pushed their way in the Eastern Archipelago, and made reprisals on their enemies with telling effect. Their humane and prudent conduct contributed greatly to their success in establishing trade relations with the native princes, by whom the Portuguese were detested for their cruelty, arrogance, and overbearing behaviour.

The English had now entered into competition with the Dutch in the India trade, and in 1600 the first English East India Company was founded. But the English company found their rivals too powerful. In 1602 the various companies in Holland agreed to cease their mutual competition and unite. This was the beginning of the famous Dutch East India Company, which, on 20th March, 1602, received from the States-General a charter for twenty-one years, giving it an exclusive monopoly of the trade with the East. The company had a capital of six and a half millions of florins, or £550,000, more than eight times that of its English rival. It was managed by a body of seventeen directors, known as the Council of Seventeen.

The Dutch had already (1602) established themselves permanently in Java. Here they founded the city of Batavia, which became the centre of their trade and the residence of the Governor-General of their Eastern possessions. They established factories in Malabar, drove the Spaniards from Amboyna

and took possession of the island, wrested Malacca from the Portuguese, and expelled the same nation from the Moluccas or Spice Islands. In 1621, less than twenty years after its foundation, the Company had a practical monopoly of the trade in cloves, nutmegs, cinnamon, and other products of the Archipelago. The Portuguese had been driven out, and England only waged an obstinate but unsuccessful rivalry. In 1638 the Dutch supplanted the Portuguese in Japan, and in 1656 got possession of the island of Ceylon.

In a work by Sir Walter Raleigh, entitled "Observations touching Trade and Commerce with the Hollanders and other Nations," presented to King James in the year 1603, we find a striking picture of the commerce of the Netherlands as compared with that of England.

Raleigh attributes the sudden and astonishing rise of the Netherlanders, among other causes, to the "embargoing and confiscating of their ships in Spain, which constrained them, and gave them courage to trade by force into the East and West Indies, and in Africa, where they employ 180 ships and 8700 mariners." (This, it should be noted, was only seven years after the first Dutch vessel had reached Java.) Sir Walter gives a number of interesting particulars respecting the extent of Dutch trade. He says, "We send into the Eastern kingdoms [of Europe] yearly but 100 ships; the Low Countries 3000. They send into France, Portugal, and Italy from the Eastern kingdoms through the Sound and our narrow seas 2000 ships; we, none. They trade with 500 or 600 ships into our country; we, with 40 ships to three of their towns. They have as many ships as eleven kingdoms of Christendom, let England be one. They build yearly 1000 ships, having not one timber tree growing in their own country, nor home-bred commodities to lade 100 ships, yet they have 20,000 ships and vessels, and all employed." In shipbuilding and seamanship also the Dutch sailors in those days were the superiors of the English, for Sir Walter says that while an English ship of a hundred tons required a crew of thirty men, the Hollanders would sail a ship of the same size with ten men.

We are accustomed to dwell on the naval exploits of Drake, Hawkins, and Frobisher, on the enterprise of the Elizabethan sailors and merchant-adventurers, and on the marvellous success of our own great East India Company. We have good reason to feel pride in the deeds of the gallant English seamen of those days, and in the trade which in later times has carried the English flag into every sea. But we are apt to forget how comparatively recent is the predominant position of England in commerce and in naval power. In the 17th

century it was the Dutch who were the sailors and the merchants of the world and the masters of the sea. Not London, but Amsterdam, was the great emporium for the products of East and West, the centre of the world's trade, and the richest city on the globe. The commerce of Europe and of the world was in the hands of the merchants of the Low Countries, who had a hundred ships afloat for every one owned by Englishmen.

TASMAN'S LIFE AND VOYAGES.

I.—Youth and early Voyages, 1603–1638.

It was in the midst of the Eighty Years War, in the year after the foundation of the Company in whose service he was to win his fame, and in the same year that Sir Walter Raleigh presented to King James his memorial on the trade of the Hollanders, that Abel Janszoon Tasman stepped onto this world's stage. He was born in the little inland village of Luytjegast, in the province of Groningen, in the year 1603. Groningen is the most north-easterly province of Holland, and formed part of the ancient Friesland. It is flat, even for proverbially flat Holland. The highest hill, the Doeseberg, rises to a height of only 35 feet above the level of the ocean, and some of the country lies even below the sea level. It is protected from the furious inroads of the North Sea by magnificent dykes of timber and stone. Behind these massive ramparts stretch wide and fertile fields and meadows, rich in agricultural and dairy produce. The cultivators, who hold their lands under a species of tenant right, are at present the richest and most prosperous peasant farmers in the whole of Europe. In Roman times the Frisians occupied the country from the Elbe to the Rhine, including the extensive tract now covered by the Zuyder Zee, over which the sea burst so late as the thirteenth century. They were sea rovers as well as cattle herdsmen, and were distinguished for their fierce independence and indomitable love of liberty. They were one of the tribes that took part in the conquest of Britain. At this day the Frisian language, spoken by a handful of people, is the most nearly related of all Low German dialects to the English, and the men are nearest to the English in blood. The Frieslanders are of a different race from the inhabitants of Holland proper. The typical Dutchman is squat and short-legged; the Frieslander, tall, yellow-haired, blue-eyed, and of powerful build. We may fairly believe that Tasman belonged to this tall, bold, and impetuous race, who supplied no small proportion of the hardy fishermen and sailors whose daring made Holland a great sea power.

We have no information as to the Tasman family, but it is to be presumed that its social status was a humble one. How Abel came by the surname which is now world-renowned is a matter of dispute. In the Luytjegast district family names were unknown until the beginning of this century. The son added to his own christian name the christian name of his father; thus, Abel, the son of John, became Abel Janszoon, and by this name simply Tasman is often designated in the old records. A nickname was often acquired, derived from some personal peculiarity, from a trade, a sign, or a ship. It has been conjectured that either Abel Jansz or his father took the name Tasman or Taschman from a boat or vessel named the *Tasch* (bag or net), belonging to the family.*

Of young Abel's early life in the flat polders or meadows of Luytjegast there is no record. The boy would see little or nothing of the horrors of the war which for forty years had been desolating a great part of the Low Countries. The most desperate part of the struggle was over with the death of Alexander of Parma. The gloomy bigot and tyrant, Philip the Second, was dead. Flanders had fallen, and had become an obedient and desolate Spanish province, under the rule of the Archduke Albert and his wife Isabella of Spain; but the United Provinces, under Prince Maurice of Nassau, son of William the Silent, were not only holding their own against the Spaniards, but were daily growing in prosperity and power. When young Abel was six years old they had succeeded in wringing from their exhausted enemy a twelve years' truce, with the acknowledgment of the Republic, and of its right to carry on the India trade. The boy's imagination must have been often stirred by tales of the daring deeds of the Beggars of the Sea, and the heroic resistance of Hollanders and Zeelanders to the mighty power of Spain. Not less must his spirit of adventure have been stimulated by the stories that drifted to his quiet village telling of the riches of India, of the Spice Islands, and of far Cathay. Small wonder that the old sea-roving Frisian blood asserted itself, and that Abel Jansz, like the majority of Hollanders in that age, found his vocation as a sailor. That he had managed to acquire some education is evident from the fact that he had at least learned to write, a somewhat rare accomplishment in those days for persons in his humble station.

It is not unlikely that in the fisheries of the North Sea, that nursery of daring sailors, he served his first apprenticeship to the ocean. But the adventurous spirit was strong within him, and it was natural that he should soon find his way to

* In the Archives of Hoorn there is a document relating to a ship called the *Tasch*, of which the skipper was Cornelis Gerritszoon Taschman.

Amsterdam, the centre of the commerce of the world, eager to seek his fortune in the rich eastern lands which his countrymen had won. He had married young—either in his native province or in Amsterdam—and his wife, Claesjie Heyndricks, had died, leaving him an only daughter. When we get the first definite information respecting him he was a widower, living in the Terketelsteeg (Tarkettle Lane), one of the poorest quarters of Amsterdam. Here, on the 27th December, 1631, he married his second wife, Jannetjie Tjaers.* He was not encumbered with property,—at least his name does not appear in the contemporary register of assessment for the half per cent. tax. His wife was not greatly his superior in social position, and could not sign the marriage register. She belonged to a working-class family,—her father being a powder-maker, and her brother a sailor, like her husband. The family were not, however, altogether without means. They were owners of one, if not two, small houses in Amsterdam. The young couple began life in a more respectable locality than Tarkettle Lane, setting up house in the Palm-street. It cannot have been long after his marriage that Abel Jansz, then 28 or 29 years old, made what was probably his first voyage to the East Indies, in the service of the Dutch East India Company. That shortly after this time he was in the service of the Company in the Eastern Seas we know from independent evidence. Mr. Heeres has found in the old Colonial archives two declarations signed by Tasman in 1634, which inform us of his rapid rise, during the space of two years at most, from the position of a simple sailor to that of master of a ship. In May he was mate of the ship *Weesp (Wasp)*, trading from Batavia in Java, to Amboyna in the Moluccas. In July the Governor of Amboyna appointed him master—"skipper" was the term in those days—of the jacht† *Mocha*.

Tasman was therefore employed in the spice trade, the chief centre of which was the Moluccas or Spice Islands, and especially Amboyna and the Banda Isles, the native home of the nutmeg and the clove. In these days it is difficult for us to understand the value which our forefathers, even down to the end of the 17th century, set upon eastern spices—pepper, cinnamon, ginger, nutmeg, and especially

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*The following is a translation of the entry in the Register of the Amsterdam Church, dated 27 December, 1631:—Abel Janss. of Luttiejast, seaman, aged 28 years, living in the Terketelsteech, widower of Claesjie Heyndricks; and Jannetie Tjaers, of Amsterdam, aged 21 years; her sister Geertie Tjaers being present, living in the Palm-street. [In the margin.] Dirckie Jacobs, the mother, consents to the said marriage, as Jan Jacobs attests.

†"Jacht," a small ship of from 100 to 200 tons burden.

cloves. It has been remarked that at banquets in England in the Middle Ages a place next to the spice-box was more coveted than the proverbial place above the salt. This may probably be explained by the fact of the little variety of food possible during the Middle Ages, when (in the winter especially) all classes had to live mostly on salt provisions—especially salt fish—and had hardly any fresh vegetables, until the Dutch taught Europe how to grow them. Before the discovery of the route round the Cape, a pound of spice was often worth as much as a quarter of wheat. After Da Gama's voyage the trade remained for a century in the hands of the Portuguese, and the monopoly yielded them enormous profit, sometimes as much as fifty-fold. The hope of getting possession of this coveted trade was the chief incentive to Dutch efforts to reach the Indies. Pepper, ginger, and cinnamon were too widely grown to enable them to command a monopoly, and in these articles the English East India Company was able with more or less success to divide the trade with the Dutch. It was otherwise with the more valued spices, such as nutmeg and cloves. These were limited to a few of the East India Islands. Cloves in particular grew nowhere but on two or three islands of the Moluccas. To secure the monopoly of these the Dutch accordingly bent all their energies. In 1605 they succeeded in driving the Portuguese out of Amboyna, and obtaining the mastery of the whole of the Moluccas. The English East India Company kept up an obstinate rivalry, but the Dutch met them with determined hostility. They attacked the English factories on small pretext, captured their vessels, and, after the massacre of a number of English traders at Amboyna, in 1623, finally excluded their rivals from all share in the trade. This contest for the spice trade was the origin and chief cause of the long and bitter enmity between the two nations. To such lengths did the Dutch go that some years later they ruthlessly rooted up the clove plantations on all the islands of the Moluccas except Amboyna and Banda. Here alone did they allow the clove to be produced, in order that they might enhance the price and make certain of preserving their monopoly.

But to return to Tasman. It is evident that his singular capacity had soon made itself evident to the colonial authorities, for in August, 1635, we find the simple sailor of three years before, now as "Commandeur Abel," cruising at the head of a fleet of small vessels (*kiels*) to protect the jealously guarded monopoly from foreign intrusion, and generally to harass the ships of hostile European rivals in the waters of Amboyna and the Banda Sea. In September, 1636, he was on his way back to Batavia, the centre of Dutch rule and the residence

of the Governor-General of the Indies. On his arrival, he found himself involved in difficulties with his crew. They cited him before the Chief Magistrate's Court complaining that while cruising in the Banda Sea he had, presumably in the interests of his own pocket, stinted them of their necessary allowance of rations. As he was acquitted by the Court, which was sufficiently experienced in such matters, we may conclude that he was unjustly accused: at least we may give him the benefit of the doubt.

He was now bent on revisiting the home country, and to accomplish this he was ready to accept for the time a subordinate post, and accordingly shipped as mate on board the *Banda*. The *Banda* was the flagship of a homeward-bound fleet (*retour vloot*) of several sail. Her skipper was Matthys Quast, a bold and capable sailor, of whom we shall hear more presently. When on the point of sailing, on 30th December, 1636, the officers and crew, 111 in number, were required to make a declaration, which is interesting as illustrative of the troubled state of the times, of the dangers of war, and the prevalence of privateering. It also shows the survival of the ancient usage—a part of the old maritime law of the 13th century, the Roles d'Oléron—which gave to the ship's Council, and even to the common sailors, a voice in the control of the voyage. By this declaration—to which the whole 111 set their signatures or marks—the Governor, skipper, merchant, mates, officers, soldiers, and seamen, presently appointed and sailing on the ship *Banda*, solemnly promised that, in view of the Spanish men-of-war and the privateers of Dunkirk, they would in no wise pass through the English Channel, but would hold their course round England, Ireland, and Scotland, so that they might in safety make the harbours of the Fatherland.

The *Banda* arrived at the Texel on 1st August, 1637, after a seven months' voyage. Tasman remained at Amsterdam for some months with his wife Jannetie, who had recovered from an illness so serious that she had made her will. This will is still in existence. It was drawn up on 18th December, 1636, by the Notary, Pieter Barcman. It recites that the worthy Jannetje Tjercks, wife of Abel Jansz Tasman, citizen, was then lying ill in bed, but was of good memory and understanding. Her residence was at the corner of the Palm cross-street on the Braeck. Should the testatrix die without issue, then, after certain bequests to the poor, she constituted her sister, Geertje Tjercks, her sole legatee. There is no mention of her husband or of the little step-daughter, Claesjen. We need not therefore assume that there had been any quarrel between the married pair. The absence of Abel in the

Indies, from which return was so uncertain, may explain why the wife should leave her property to relations on the spot.

Meantime Abel and his brothers-in-law appeared before the Amsterdam magistrates with the object of selling the family house in the Palm-street for 500 florins. For some reason the contract was cancelled, and the family retained the house until 1650, when Powels Barentsz, in his own name, and as attorney for his brother-in-law Tasman, who was then in the Indies, conveyed the property to Andries Barents.

After a stay of some nine months in Amsterdam, Abel Jansz once more set his face eastwards. He entered into a new ten years' engagement with the Company, and in consideration of this he was allowed to take his wife with him—the Council of Seventeen having just passed a new regulation whereby the chief officers were permitted to take their wives to the East Indies, provided they were lawfully wedded, were of good lives, and could show good credentials. Tasman was put in command of the fly-ship* *Engel* (*Angel*), fitted out by the Amsterdam Chamber. The *Engel* sailed from the Texel, 15th April, 1638, and arrived at Batavia on 11th October following. The skipper's pay was 60 guilders (£5) per month. On arrival at Batavia he was continued in his post for three years at an increased pay of 80 guilders (£6 13*s.* 4*d.*) per month.

II.—Voyages in Japan Seas, &c., 1639-1642.

It is in the year following his return to Batavia, some six years after his first voyage thither, that we find Abel Jansz first chosen to take a prominent part in a discovery expedition.

The enterprise of the early Dutch governors in their efforts to open up new trade for their Company was ceaseless. Jan Pieterszoon Coen, Governor-General between 1618 and 1629, was the most illustrious, and the one who did most to consolidate the Dutch power. He it was who built the fort at Batavia, and fixed the centre of government there. He it was who in Java baffled the English, and overmastered them in the Moluccas. During his rule Dutch ships first made the coast of Australia. After Coen, the most famous governor—he who showed the greatest energy in his persistent search for new lands and new markets—was Antony van Diemen, the Governor-General who was in power when Tasman returned to the Indies, and with whom his fame will be for ever associated.

Early in the career of the Dutch Company in the Eastern Archipelago the Directors had cast longing eyes towards the

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* Fly-ships (*fluit*) were long quick-sailing ships, of light draught, varying from 200 to 400 tons burden. Fly-ships were first built at Hoorn in 1594.

powerful kingdom of the Great Khan—the Cathay whose wonders had been first revealed to Europe by the traveller Marco Polo in the 13th century. Not many years after Da Gama's discovery of the Cape route (1516), the Portuguese had penetrated to Canton, and by the middle of the 16th century (1542) had established relations with Japan, where, for a time, they exerted a great influence, and carried on a lucrative trade. When the Dutch reached the East they were not slow to follow in the footsteps of their rivals. Seven years after the foundation of the Company they sent ships to Japan, and continued to trade there every year, in spite of the violent opposition of the Portuguese. Finally they were allowed to set up a factory on Firando, an island to the west of Kiusiu, and this soon became one of the most profitable stations of the Company's trade.

In 1635 a certain William Verstegen, residing at Firando, sent a letter to Batavia stating that the Japanese reported that many miles to the eastward, in latitude 37½° North, there was "a very great country or island, rich without measure in gold and silver, and inhabited by civilised and friendly people." This was just the sort of report to excite the imaginations of those early traders, who were constantly tantalised by dreams of a new Mexico or Peru to be discovered in the Pacific. It was known that in 1620 the Spaniards had searched in vain for this golden island ; but, undeterred by the former failure, Governor-General Van Diemen and his Council resolved to fit out an expedition to make the discovery. The scheme, through various domestic troubles, lay in abeyance for some years, but in 1639 two ships were fitted out for the adventure. Tasman's ship, the *Engel*, was one of the vessels chosen. The other was named the *Gracht* (*Canal*), and was under the command of an experienced sailor and pilot, Matthys Hendrikszoon Quast, under whom Abel had sailed as mate in the *Banda* on the homeward voyage three years before. Quast was chief, and Tasman second in command. Tasman was now about 35 years old; he had been but six years in the Company's service, and had not only risen from the grade of a simple sailor to that of captain of a ship, but was now entrusted with the second place in a difficult and important enterprise. His rapid promotion proves that Quast and the Colonial authorities had recognised in him high qualities as a seaman and a leader of men. The ships sailed from Batavia on 2nd June and made their way round the north of the Philippine Islands, keeping a north-easterly course until on 20th July they sighted some islands belonging to a group now known as the Bonin Archipelago. Thence they steered north-east, and then back to the Japan coast searching for the land of gold. From this point they

pushed out again into the great ocean further than any one before them, to a distance of some 2000 miles east from Japan. For two months longer they cruised backwards and forwards in those far northern seas, between 37½° and 46° north latitude, straining their eyes in vain for some indication of the golden island. They were in a wretched condition. Many of the crew had died, and the number of sick increased daily. The remnant were worn out with the hardships of the voyage, and barely able to do the incessant pumping necessary to keep their leaky vessels afloat. Their provisions were running short, and there was still no faintest sign of land. Disappointed and dejected, the commanders and ships' council reluctantly resolved to give up a fruitless search. On the 25th October they turned their ships for Formosa to obtain refreshment for the sick, and to refit. Taking the coast of Japan on their way, they came to an anchor on the 24th November, before Fort Zealandia, on the island of Tayouwan or Formosa, then a Dutch possession. They had been nearly six months at sea, and out of a crew of ninety had lost nearly forty men. No further search was ever made for the wonderful island.

In the following year Tasman made another voyage to Japan, this time for the purposes of trade, as skipper of the fly-ship *Oostkappel* (*Eastchapel*). The fleet with which he sailed consisted of eleven ships, carrying freight valued at £525,000; The *Oostkappel*'s cargo alone was worth £80,000. This gives us an idea of the value of the Japan trade. The Hollanders were now the only Europeans allowed to trade with the country. The Portuguese had for nearly a century carried on a most profitable trade, but their arrogance and intrigues, and above all the proselytising zeal of the Jesuit missionaries—who had made many thousand converts, and acquired an enormous influence—excited the jealousy and hostility of the Government. Christianity was suppressed. Foreigners were excluded from the Empire, and only allowed to trade with Firando and Nagasaki. In 1639 an insurrection led to a general massacre of the Christians, and the absolute expulsion of the Portuguese under pain of death.

The *Oostkappel* arrived at Firando on 25th August, 1640, and lay there for some three months. During her stay the Dutch got into serious trouble with the Japanese Government and were compelled to demolish their factory, which was too much like a fort to satisfy the susceptibilities of the Imperial Government. Mr. Lauts has given us the resolutions of the Council of the Dutch Factory at Firando in 1640. When the Imperial rescript arrived, Tasman, in virtue of his commission as captain of the *Oostkappel*, sat as a member of the Council, and signed its resolutions. The situation was most perilous,

but Francis Caron, the president of the Council, returned the prudent answer : "All that His Imperial Majesty is pleased to command, we will punctually obey." Still the Dutch were slow in proceeding with the work of demolition, and it was not until another Imperial rescript arrived, threatening to put the members of the Council to death if the order was not instantly obeyed, that the great stone factory—which had cost the Dutch 100,000 guilders to build—was finally levelled to the ground. They were compelled to submit to the most vexatious restrictions, and to put up with countless humiliations in order to maintain their position. But the trade was too valuable to be lightly relinquished, and by their submission the Dutch alone of European nations for more than 200 years managed to retain trade relations with Japan, though living as the Japanese said "like frogs in a well," until in 1853 the American squadron under Commodore Perry broke in upon Japanese isolation and paved the way for that remarkable revolution, the latest development of which we have seen in the recent war between Japan and China.

In May, 1641, Tasman sailed from Batavia to take in a cargo at Lauwek, the capital of Cambodia, and then to proceed to Japan. The Cambodian Kingdom at that time extended over a great portion of south-eastern Further India, now Cochin China. Its capital, Lauwek, on the great river Cambodia, was one of the most important cities of the east ; it was the centre of a great trade in furs, ivory, silk stuffs, and other merchandise, which were brought from the interior and from China and exported to Japan and other places. The Dutch, as the price of assistance given to the King in some of his wars, had a few years previously obtained leave to set up a factory at Lauwek, which was of great value to them in the Japan trade. For this factory Tasman sailed in his ship the *Oosthappel*, and in July came to an anchor in the Lauwek Roads. On his arrival he found the Dutch and Portuguese in violent conflict. A few days before a dispute had arisen between the crew of the Dutch fly-ship *Zaijer* and the Portuguese, and this, through the overbearing arrogance of the latter, had grown into a fight, and had cost some of the Dutch their lives. The Directors of the factory had appealed to the King to punish the offenders, but the Portuguese having won him over by bribes were only sentenced to pay a fine. This blood-money the Dutch refused with contempt, and since neither by entreaty nor in any other way could they obtain a juster sentence, they resolved to exact satisfaction themselves. At this critical juncture Tasman made his appearance at Lauwek, and as he lacked neither the courage nor the inclination to avenge the murder of his countrymen, he soon found an

opportunity of inflicting an exemplary punishment on the enemy.*

Since their expulsion from Japan the Portuguese had contrived to keep a share of the trade by importing their wares under the Cambodian flag. On the *Oostkappel's* arrival, a rich cargo of silks from Macao (the Portuguese settlement at the mouth of the Canton River) was being transhipped into two junks flying the Cambodian flag in order to be sent to Japan. Tasman had express instructions to attack and make prizes of all Spanish, Portuguese, and other foreign ships not provided with free passes from the Dutch Company giving them permission to trade. He therefore rapidly discharged his cargo, loaded for Formosa, and then weighed anchor and cruised outside the river to look out for the Portuguese junks. A few days after leaving the river the junks hove in sight, and Tasman gave chase. He soon overhauled one of them, and after a sharp fight the junk surrendered, and her silks, worth 5500 dollars, were transferred to the *Oostkappel*. The other junk (with a cargo worth 5000 dollars), aided by the gathering darkness, succeeded in escaping, and Tasman, abandoning further pursuit, proceeded with his spoil to Formosa. His conduct in this matter did not, however, meet with the approval of the authorities at Batavia, and Abel, for his alleged negligence in not capturing the second junk, was condemned to forfeit two months' wages. On leaving Formosa, the *Oostkappel* was overtaken by a violent storm. She lost her mainmast, and was so disabled that the ship's council judged it impossible to proceed with the voyage to Japan. The ship therefore made for Formosa, and after a most perilous voyage contrived to reach Fort Zealandia. Here the cargo for Japan was transhipped to the *Zaijer*, and the *Oostkappel* was sufficiently repaired to be able to sail under jury rig with a cargo of silks for Batavia, where she arrived on 20th December.

Although Tasman, as we have said, was fined two months' wages for dereliction of duty in allowing the Portuguese junk to escape him, it would appear that this was but a necessary part of the rigid discipline of the Company, and involved no real disgrace. His voyage with Quast in search of the "golden island" had tested his qualities of hardihood and endurance; his voyages to Japan had proved his skill and resource in seamanship; his services in the Banda Sea, and his smart action at Lauwek (in spite of nominal blame) had shown his courage and capacity, and his zeal and determination as a stout upholder of the rights and privileges—not to say of the arrogant assumptions—of the Company. Van Diemen,

* Voormeulen van Boekeren, p. 33.

ever on the watch for capable and resolute men who could further his plans for the extension of Dutch supremacy in the East, had recognised Abel's great qualities. This is plain from the important enterprises with which he was constantly entrusted. So little did his failure to capture the junk affect his standing, that within three or four months after the infliction of the fine the Governor-General offered him the conduct of an important mission, in which not only his resolution but his diplomatic skill would be put to proof. Amongst other countries in which the Dutch had early established themselves was the great island of Sumatra. They had soon elbowed out the Portuguese, and now had factories at Acheen, Djambi, and other places. The most important of these was at Palembang (not far from the coasts of Java.) This post commanded the pepper trade of the south of the island. The powerful Sultan of Palembang had long been on most friendly terms with the Dutch, but through the machinations of a Chinese named Bencki, who had fled from Batavia in debt to the Company, and had managed to ingratiate himself with the Sultan, these relations were seriously imperilled. The differences and misunderstandings which had arisen now threatened to end in war. It was with the view of bringing the Sultan to a better mind that Tasman was despatched to Palembang with a fleet of four vessels. He left Batavia on 23rd April, 1642, and two or three days later the little squadron cast anchor in the mouth of the river on which the Sultan's capital was situated. Here, by way of preliminary, Abel Jansz took possession of some junks loaded with pepper, and having transferred their cargoes to his own vessels, he sailed up the river to Palembang. His instructions were to do his best to arrange matters by friendly means before having recourse to hostile measures. He therefore sought an interview with the Sultan. To the surprise of the Dutch, the audience was not only granted, but the ambassador met with a most friendly reception. Abel showed himself a skilful diplomatist. He disabused the Sultan's mind of the prejudices instilled by the Chinaman, and dwelt on the good disposition of the government at Batavia. He showed the importance, not only to the Company but also to the kingdom of Palembang, of the maintenance of the trade and of the amicable relations hitherto existing. Finally he urged, in forcible terms, the mischief that would ensue from a war between the two hitherto friendly powers. It is perhaps doubtful whether the diplomatist's words would have been as convincing if they had not been supported by the tangible argument of a squadron of ships, commanded by a man who clearly was not to be trifled with. But, however that may be, the Sultan was

completely won over, and without further hesitation renewed the treaty of friendship. Tasman's mission being thus successfully completed, he returned with his fleet to Batavia, carrying with him the obnoxious Chinaman, and was received by Van Diemen and his Council with the warmest acknowledgments for his services in having extricated them from what had at one time threatened to be a very serious trouble.

III.—The Great Discovery Voyages to the Southland, 1642-1644.

1.—*The Unknown Southland.*

Tasman was now in his fortieth year. In ten years' wanderings and fightings in the service of the Company he had grown enured to hardships and danger. He was familiar with the great trade routes from Europe to India, with the intricacies of the waters of the Eastern Archipelago, and with the navigation of the Seas of China and Japan. He had sailed a thousand miles beyond the limits reached by any previous navigator into the unknown and mysterious regions of the cold and stormy North Pacific Ocean. In his many voyages he had proved himself a keen trader, a capable and daring seaman, a bold fighter, and an able commander. He was now ready to undertake the great adventure, the crowning achievement of his adventurous life—that voyage to the Great Southland, which, as a Dutch historian says, "must specially immortalise him; the expedition which must ever give him an honorable place amongst the greatest navigators and discoverers."

The Great Unknown Southern Continent—Terra Australis Incognita, or Nondum Cognita—had for ages been the dream of geographers. The ancient cosmographers had formulated a theory as to the existence of a huge continent in the south, which they considered necessary to balance the large continents in the northern hemisphere. The discovery of North and South America only lent fresh weight to this conjecture, and it was commonly supposed in the 16th and 17th centuries—and indeed was almost an article of faith—that below the Equator there was a huge continent which had still to be discovered and explored.

It was in 1513 that the Spaniard Vasco Nunez de Balboa first saw the Pacific from a mountain in Panama. Ferdinand Magellan was the first to enter it. Leaving Spain in 1519, with five small ships of from 130 to 60 tons, this heroic navigator felt his way through the Strait which bears his name, and crossing the great ocean, after months of suffering reached the Ladrones. He himself was killed at the Philippines, but

one of his ships, the *Victoria*, with a handful of men, returned to Spain, after a voyage lasting three years, having been the first to circumnavigate the globe. Magellan's voyage was prompted by the desire of Spain to find a way to the Moluccas on the west, with the object of disputing the claims of Portugal, and wresting from her the spice trade. With a similar object, the Spanish Viceroys of Mexico and Peru despatched various expeditions to the Moluccas. In one of these voyages, in 1528, Saavedra, sent out by Cortez, sighted New Guinea, which had previously been seen by the Portuguese. In 1564 the Philippines were colonised by the Spaniards. In another voyage, in 1568, Mendana discovered the Solomons, and brought to Peru such a glowing account of their wealth that in 1595 he was despatched with a fleet to found a settlement there. He failed, however, to find the islands, and unsuccessfully attempted to plant a colony on Santa Cruz. Fernandez de Quiros, his pilot on this voyage, was firmly persuaded that here at last was the great Terra Australis. He petitioned the King of Spain to be allowed to colonize it, and in his memorial "it is soberly affirmed to be a terrestrial paradise for wealth and pleasures." He declares that the country abounds in fruits and animals, in silver and pearls, probably also in gold, and is nothing inferior to Guinea in the land of Negroes. In 1605 Quiros set out from Peru with a powerful fleet to settle a plantation in the southern paradise. On a large island which he discovered, and which he took to be a part of the Southern Continent, and named Australia del Espiritu Santo—it is in fact one of the New Hebrides—he founded the short-lived and unfortunate town of New Jerusalem. One of his companions, Luis Paz de Torres, separated from the fleet and steered westward, sailing through the strait which now bears his name, and skirting the south coast of New Guinea. The first Englishman to enter the Pacific was Sir Francis Drake. In his "Famous Voyage" in 1577 he stole through Magellan Strait, fell upon and plundered the Spanish settlements in Peru, and, following in Magellan's track across the South Sea, made the Moluccas, and returned to England laden with booty. In the latter part of the 16th and early part of the 17th centuries several Dutch navigators accomplished similar circumnavigations. All these expeditions crossed the Pacific near the equator, and though they discovered islands they threw no light on the problem of the Terra Australis. More important was the voyage of the Dutch navigators Le Maire and Schouten in 1616. They found a new passage into the South Sea, between Tierra del Fuego and Statenland. Sailing through this Strait of Le Maire they reached the open ocean,

LUNA

MERCURIUS

VENUS

SOL

MARS

IUPITER

SATURNUS

SEPTENTRIONALES PLANETAE

QUATUOR ELEMENTAE

IGNIS

AER

AQUA

TERRA

QUATUOR ANNI TEMPESTATES

VER

AESTAS

AUTUMNUS

HYEMS

NOVA TOTIUS TERRARUM ORBIS GEOGRAPHICA AC HYDROGRAPHICA TABULA. à Pet. Kerio.

Ulterius Septentrionem versus America omninò est incognita sive aqua vel terra hoc loco incertum est. plurimi tam ex rerum circumstantijs, conjectant Americam ab hac parte Septentrionali mari succinctam.

Anian Fretum et Fretum Joannis Davis latitudine 60. grad. è regione insularum Orcadum sorte unu et idem est, plurimi enim multis argumentis contendũ oram littoralem Americæ Borream versus eousque protendi donec, in modum insulæ cum terra Laboratorijs aut Groenlandiæ connexa fuerit. Quod an verum sit sepositis, sed fructus, qui situm est propter ventorum asperas et impetuosas turbines et maris fremitus terribiles, modo glacies non vetus planoque horentes.

AMERICA
Anno Domini 1492 a Christophoro Columbo nomine Regis Castelle primum detecta, et ab Americo Vesputio nomen sortita 1499.

Fretum hoc Davis, ab inventore Anglo nomen habet qui an. 1585 86. et 87. hujus itinera peregit transitum illac in Chinam scrutatus.

AMERICA SEPTENTRIONALIS

MARE DEL ZUR

PACIFICUM MARE

MARE DEL NORT

OCEANUS AETHIOPICUS

MARE INDICUM

INDIA

Nova Zembla

Nova Francia

Nova Guinea

Insulae Salomonis

Linea Aequinoctialis

Tropicus Cancri

Tropicus Capricorni

Fretum Magellanicum

Terra Australis nondum cognita

Terra Australis Incognita

Circulus Arcticus

Circulus Antarcticus

Oceanus Ducatedonius

Mare Pitzorke

Mare Arabicum

Mare Meditteraneum

Hanc continentem Australem Magellanicam regionem adhuc inventore nuncupant.

Cum ob terrestrem sphæram hoc modo in planum redactam situm prope polos animadvertere non possimus, Borealiorum et Australiorum partem a quinquaginta parallelis hucusque circa polos hic delineatas conclusimus vale et fruere.

Promontorium Ferrei distans his distans 450 Lucas à Capite Bonæ Spei & 600 à promontorio S. Augustini.

Inter S. Laurentij & Los Romeros insulas vehemens admodum est versus ortum et occasum fluxus et refluxus maris.

Amstelodami Excudebat Joannes Janßonius.

Novem Climata Borealia

Novem Climata Australia

ZONA TEMPERATA ZONA TORRIDA FRIGIDA

FRIGIDA ZONA

MURUS BABYLONIE

COLOSSUS

PYRAMIDES

MAUSOLEUM

DIANÆ TEMPLUM

IUPITER OLYMPICUS

PHAROS

doubled Cape Horn, and crossed the Pacific in a higher latitude than Magellan and Drake. Being so far to the south as 17° S. lat. they confidently expected to fall in with the great Southland, but were constantly disappointed, finding nothing but a few islands. Le Maire's ships, on reaching Batavia after their long voyage, were seized and confiscated by his countryman, Governor-General Coen, for having come into the Indies in violation of the charter of monopoly of the Dutch East India Company. This damped the ardour of explorers for many years, so much so that for nearly a century no Dutch navigator ventured again to attempt the circumnavigation of the globe.

These various expeditions had somewhat circumscribed the possible area within which the Southland might be found. Still the old cartographers found the idea of a sea full of islands so little in harmony with their prepossessions, that in the early part of the 17th century (even so late as 1640) they boldly drew on their maps of the world a huge "Terra Australis Nondum Cognita." This was depicted as surrounding the South Pole, and occupying a very considerable portion of the Southern Hemisphere. In the South Atlantic the Promontorium Terræ Australis jutted northwards towards Africa. On the west only the narrow Straits of Magellan and Le Maire broke its continuity with South America and gave the sole means of passage into the South Sea. On the eastern side this continent of the mapmakers blocked all access to the Pacific. It extended in a solid but gradually narrowing mass from the Pole up to the very Equator. In this respect the maps were a jumble compounded of discoveries, actually made but imperfectly known, fitted on to a baseless theory. It is pretty certain that Portuguese ships sailing from the Eastern Archipelago had somewhere between 1512 and 1542 seen the north-west coast of Australia, and that these discoveries were vaguely indicated on some of the early charts. They appeared on the cartographers' maps as the land of Beach, exceedingly rich in gold. New Guinea had been sighted by the Portuguese Maneses in 1511, and again by the Spaniard Saavedra in 1528: therefore Nova Guinea appeared as the most northerly extension of the continent under the Equator—sometimes as an island separated by a narrow strait, sometimes as an integral part of the continent itself. Beyond New Guinea it is probable that the reported discovery by the Portuguese of certain vague and imperfectly known lands forming part of the coast of Australia justified the delineation of the north-eastern shores of the continent. But from the point where information failed imagination stepped in, boldly carrying the coast-line from Queensland down in a south-easterly direction

to Magellan's Strait and Cape Horn, and filling the South Pacific with an imaginary continent. *

When the Dutch had established themselves in the Eastern Archipelago, their spirit of enterprise and adventure, and their ambition to win new realms for the Company's trade, were only stimulated by their unprecedented success. It became an object of ardent desire to the Home Directors, the Council of Seventeen, and to the successive Governors-General of the Indies to explore the mystery of the Great South Land; if, perchance, they might there find a second Mexico or Peru, rich in gold and silver, or new spice islands, to increase the profits of their trade; or, at the least, to discover a direct way from their eastern possessions, by the Great South Sea, to Peru and Chili, which would make it easy for them to harass and plunder the Spanish ships and the settlements of South America. It was in 1605—only three years after the foundation of the Company—that the first attempt was made; and the object of this expedition was limited to the exploration of the regions lying to the east of the Banda Islands. With this view, the *Duyfke* (*Little Dove* or *Darling*) sailed from Batavia in 1605, visited the Island of Aru, sailed along the south coast of New Guinea, and reached Cape Keer Weer, in 13° S. lat., on the east side of the Gulf of Carpentaria—her captain thinking, however, that he was still on the west coast of New Guinea.

For a number of years the want of suitable vessels which could be spared from the needs of the East India settlements, and the hostilities in which they were constantly involved with their European rivals in the spice trade, coupled with the necessity of consolidating their power in the Eastern Archipelago, prevented the Colonial authorities from engaging in distant adventures. The first Dutch discoveries on the west coast of Australia were not the result of design, but were accidental—or, at least, unpremeditated.

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* The prepossession in favour of a Southern Continent was inveterate in the 17th and 18th centuries. When Tasman made the west coast of New Zealand he was confident that at last he had discovered the west side of the long-sought Terra Australis Incognita So late as 1771, Alexander Dalrymple—the Hydrographer to the Admiralty, and the jealous rival of Cook—published a collection of voyages to the South Sea with the express object of demonstrating the existence of a huge Southern Continent. The only part of the Pacific then unexplored was that lying between New Zealand and Magellan Strait. This gave nearly the area which, by elaborate calculation, Dalrymple showed was necessary to preserve the equilibrium of land between the northern and southern hemispheres. He therefore concluded that this space south of the Equator must be almost entirely solid land. Within four years of the publication of Dalrymple's work, Cook in his second voyage, by sailing over the site of the imaginary continent, finally dissipated the fable, and reduced the Terra Australis Incognita to the frozen mass within the Antarctic circle.

When the Hollanders first made their way to the East Indies they naturally followed the old routes taken by their Portuguese predecessors and rivals. After rounding the Cape of Good Hope they shaped their course either inside or outside Madagascar, and thence made their way as best they could—either north to India or east to Java. This route had many disadvantages. Numerous rocks and islands, the positions of which were imperfectly known, lay in the track, and were a constant source of danger. The south-east trade winds drove the ships to the northward, and, as they got into the tropics, they met with light, variable, and baffling winds, which delayed them for long weeks, so that it was no uncommon thing for the outward voyage to last thirteen months. Nor was the loss of time, and consequent damage to cargo, the only evil. Scurvy—the scourge of all early voyagers—produced by the long and exclusive use of salt diet, attacked the crews. Many died, and the survivors arrived at their destination broken down by sickness, and often short of provisions and water.

Bad as the Madagascar route was, the Dutch, for more than fifteen years, were unable to find a better. At last, however, in December, 1611, Commander Hendrik Brouwer, who had sailed with two ships from Holland to the east, wrote to the Council of Seventeen, reporting his arrival at Java. After leaving the Cape he had run due east in about 36° S. lat. for some 3000 miles. He had kept a strong westerly wind for 28 days, and had reached Batavia after a passage of less than seven months, having lost only two men from sickness. This was unprecedented; and he strongly advised that all outward-bound ships should be ordered to take the south route, by which they might make sure of short passages—seeing that if they failed to get west winds in 36° S. they would be certain to do so if they ran to 40° or 44° S. Although the long distance run to the south seemed a disadvantage, it was largely compensated for by the gain of running down the easting in a high latitude. It was open sea all the way in this southern ocean, with none of the rocks and dangers which beset the northern route, and the coolness of the weather was of great importance to the health of the crews.

In consequence of Brouwer's report, seconded by the recommendation of Governor-General Coen, the Directors ordered their outward-bound ships to take the new route. Rewards were offered for quick passages—150 guilders for a passage under nine months, 600 guilders if they arrived within seven months. The superiority of the new route was soon apparent. Of three ships sailing at the same time from Holland in 1614, the *Hardt* took Brouwer's route and reached Batavia in six months, while the two others by the Mada-

gascar passage were 16 and 18 months in making the voyage. It was in running far east under the new sailing directions that in 1616 the ship *Eendragt* (*Concord*) first sighted the South Land (*i.e.* the west coast of Australia), in 26° S. lat., at Shark Bay; her captain, Dirk Hartog, landing on an island which still bears his name, and putting up an inscribed metal plate, which remained there up to the early part of the present century. The voyage was not without danger, as an English ship, the *Tryal*, found to her cost; for, following the new Dutch route in 1621, she ran onto the Trial Rocks in 20° S. lat., and was totally wrecked, only a few of her crew succeeding in reaching Batavia in the boats.

From Hartog's ship the new discovery received the name of Eendragt Land, and in the next four or five years the captains of other ships on the same voyage sighted the west coast, amongst them Edel and Houtman, who in 1619 made the South Land in $32\frac{1}{2}$° S. lat.—north of the present site of Perth—and sailed along it some hundreds of miles, giving it the name of Edel Land, and also naming Houtman's Abrolhos.

Instructions were issued by the Directors in 1620 and 1621 that outward-bound ships leaving the Cape should keep an east course between 30° and 40° S. lat. for 4000 miles, or until they should sight the "New Southland of the Eendragt." With our modern notions these instructions appear extraordinary, but in the then existing state of navigation they were practical and well judged. The appliances at the command of ship captains in those days were very imperfect. Without the sextant or the chronometer there was the greatest difficulty in determining the ship's position. It is true that they could find the latitude by the cross-staff with reasonable accuracy, but they had no means of finding the longitude except by the rude process of dead reckoning by the log. They had no reliable charts, and had to depend very largely either on their own personal experience of former voyages or on the advice of pilots who had sailed the seas before. It was therefore no uncommon thing at the end of a long voyage for the captain to find himself some hundreds of miles out of his reckoning—sometimes even as much as 400 or 600 miles. Thus Brouwer, in the voyage above mentioned, made Sumatra, when according to his estimated position on the chart he was still 320 miles to the westward of the island. The object of the new instructions was, therefore, to enable the ships to ascertain their position after their long run to the east. When they made the Southland they ran north along the coast until they reached the known point of Eendragt Land in 25° or 26° S. lat. From this they took a new departure, and by steering a N.N.W.

course could make pretty sure of striking the south coast of Java. The new plan led to several ships sighting various parts of the west coast of Australia in the course of the next six or seven years. Amongst others, the despatch jacht *Leeuwin, (Lioness)*, in 1622, doubled the Cape to which she gave her name. Even by the new route the voyage to the Indies was often very protracted, the *Leeuwin*, for instance, taking 13 months to reach Batavia. There was also the danger of overshooting the mark, as Pieter Nuyts found (1627), when in the *Gulde Zeepaert (Golden Seahorse)* he found himself at the islands of St. Peter and St. Francis, at the head of the Great Australian Bight, and had to coast back some hundreds of miles until he could round Cape Leeuwin.

The new discoveries quickly attracted the attention and interest not only of the Colonial Government but of the Home Directors, and were a frequent subject of correspondence between the Council of Seventeen and their Governors-General. As early as 1618 the Directors wrote to Governor-General Coen respecting the discovery of a great land situate to the south of Java reported by the ship *Eendragt*, Commanders Houtman, Edel, and others, recommending that ships should be sent to examine it and report on its inhabitants and resources, and the opening it might offer for profitable trade; and also to try to find a passage eastward into the Great South Sea. Accordingly, in the next few years several attempts at systematic exploration were made, but with little success. The only result was the discovery by the ships *Pera* and *Arnhem*, in 1623, of a portion of the north coast of Australia (now part of the Northern Territory of South Australia), which was named Arnhem Land, and the naming of the Gulf of Carpentaria, after the Governor-General Carpentier.

One further addition to the knowledge of these coasts was made by De Wit, whose ship, the *Vianen*, leaving the East Indies in January 1628, in the north west monsoon, was driven on to the north west coast of Australia about the Kimberley District, and who named the country De Wit Land.

The total result of these various discoveries and explorations was that the coast of Australia, from Cape York on the north to the centre of the Great Australian Bight on the south, had been traced more or less continuously by Dutch ships in the twelve years between 1616 and 1628. This coast was now called by the Dutch "The Known South Land" to differentiate it from those unexplored and supposititious regions for which, with practical sense, they retained the old appellation of "The Unknown South Land." Down to very recent times the names of these early Dutch discoveries were retained on the maps of Western Australia. Half a century ago, when across

the centre of Australia was written the simple word "Unexplored," almost the only names appearing on the Western Coast were those given 200 years before by the captains of the ships of the Dutch East India Company in the early years of the 17th century. Beginning with Nuyts Land in the Great Australian Bight, and going north, we had Leeuwin Land, Edel Land, Eendragt Land, De Wit Land, and Arnhem Land. A few names still remain as evidence of the Dutch discoveries — Cape Leeuwin, Houtman's Abrolhos, Dirk Hartog's Island, and the Gulf of Carpentaria.

Such was the state of Dutch knowledge of Australia when Antony Van Diemen became Governor-General of the Dutch Indies, in the year 1636. Van Diemen was one of the most notable of the many notable men who served the East India Company in the early years of its power. Being involved in debt, he had gone to the Indies, either to escape his creditors or to retrieve his fortunes. He showed so much capacity that he was appointed Secretary to Governor-General Coen. From this time his rise was rapid. In 1626 he became one of the Councillors of the Indies, and, after important services, he was appointed Governor-General, in 1636.*

He came to his government at a time when the Dutch power had been so firmly consolidated by Coen, Carpentier, Brouwer, and others of his predecessors in office, that the Dutch were undisputed masters of the Eastern Archipelago, and had a virtual monopoly of the trade. Freed from the difficulties with the native powers and foreign rivals which had embarrassed his predecessors, he had the leisure and the means to prosecute new enterprises. His zeal for discoveries which might bring increased wealth and power to his Company was unbounded, and is shown not only by his frequent despatches on the subject to the Council of Seventeen in Holland, but by the expeditions which he planned and sent out during the term of his nine years' government.

It will be observed that the first attempts at exploration from the Dutch East India Settlements were directed to the regions east of the Banda Sea, and had for their chief object the exploration of New Guinea, and especially the determination of the question whether New Guinea and the known South Land formed one continent, or whether there was a strait between them by which access could be gained to the Great South Sea. It was to the solution of this problem that Van Diemen first applied himself in the very year in which he received his appointment as Governor-General, ignorant of the fact that the Spaniard Torres had already solved the

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* Du Bois ; *Vies des Gouverneurs Généraux*,

problem by sailing through the strait that now bears his name, in the year 1606.*

In the year 1636 Van Diemen despatched two ships from Banda under the command of Captain Gerrit Thomasz Pool, with instructions to proceed along the south coast of New Guinea. If, contrary to all expectation, a strait was found between New Guinea and the South Land, Pool was to sail through it and trace, if possible, the east coast of the Known South Land, circumnavigating it and returning home along Nuyts Land and Eendragt Land. If, however, as seemed most probable, New Guinea was joined to the Known South Land, he was to sail along the northern and western coasts of Australia as far south as Houtman's Abrolhos, searching all the way for any possible passage to the Pacific. More particularly was he to search the more northerly parts, as it was presumed that a strait was more likely to be found in that quarter than further south, where the South Land was presumably much wider. If Pool with some of his crew had not been murdered by the savages of New Guinea, it is possible that he might have sailed through the strait already traversed by Torres, and have anticipated Captain Cook in the discovery of New South Wales. As it happened, however, the ships returned without having discovered anything of importance. In the same year Van Diemen planned the expedition to search for the supposed "golden island," east of Japan, which three years later was undertaken by Quast and Tasman, with the result we have already seen.

2.—*The Planning of the Great Discovery Voyage.*

Governor Van Diemen's heart was now set on a complete exploration of the Unknown South Land, in which he hoped to discover a new Peru, rich in silver and gold, or at the least fertile countries inhabited by civilised people, in which might be found new and yet undreamed of commodities to bring fresh wealth into the already overflowing coffers of the East India Company. For some years domestic troubles and the want of suitable ships delayed the execution of his plans; but in the year 1641 he writes to the Council of Seventeen:—"We are very desirous to make the discovery of the South Land. The fly-ship *Zeehaen* was intended for this service, but through the strange delay of the ships from Persia and Suratte we were compelled to employ this same *Zeehaen* for the last voyage to Tayouwan and Japan. Moreover, we have kept here in the

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* The discovery of Torres remained unknown until the English took Manilla in 1762, and discovered in the Archives a copy of Torres' original letter to the King of Spain. *See* Major; *Early Voyages*.

harbour idle, as much to his vexation as to our own, the renowned pilot Frans Visscher, whom we intend to employ for the discovery of the South Land; however, this shall, as we hope, be yet effected once for all."

This same Frans Jacobszoon, *alias* Visscher, took an important part as the adviser of Governor-General Van Diemen in his plans for the projected voyage of discovery. Visscher was a native of Flushing, and had been for many years in the service of the Company. He had repeatedly made the outward and homeward voyages. In 1623, as mate of the ship *Hope*, he had sailed round the world in the celebrated Nassau fleet, under the command of L'Hermite and Schapenham. He had traded in the East for many years, chiefly in the Japan trade, and was thoroughly acquainted with the coasts of Tonquin, China, and Formosa. In those days, when navigation had not been reduced to a science, and charts were either wanting or not to be depended on, the Dutch captains in the uncharted eastern seas had to place their chief reliance for safe and prosperous voyages on the personal experience of those officers and seamen who in former voyages had gained a knowledge of the coasts and rocks, the currents, and the winds of the seas they were traversing. These pilots, for the most part, were jealous of their knowledge, and indisposed to make it public, notwithstanding the repeated complaints and injunctions of the Company. Amongst these pilots, Visscher, from his long and varied experience, and from his skill and capacity, was one of the most renowned. His knowledge and experience were freely placed at the disposal of the Company, as is often made matter of honorable mention in the despatches of the Governor-General. He had made charts of the coasts and islands of the China Seas, of Formosa, the Piscadores, and Japan, and is continually referred to as one of the best chart-makers of his time. It was this man that Van Diemen consulted on the projected expedition, and, as we have seen, for this purpose he detained him—very much to Visscher's chagrin in those stirring times—for nine months in idleness at Batavia, for the benefit of his advice.

In January, 1642, Visscher wrote a report to the Governor-General on the proposed discovery of the Unknown South Land. This report is a masterly document, and gives us a high idea not only of Visscher's practical ability and knowledge as a seaman, but also of his sagacity and sound judgment. The old pilot wastes no words on fanciful speculations about the mysterious South Land. He goes straight to the point, states the conditions necessary for success, discusses possible difficulties, and, in short and concise terms, lays down a clearly defined and carefully thought-out scheme—or rather choice

of schemes—for exploring both the Unknown and the Known South Lands, and, indeed, for obtaining a knowledge of the whole Southern world.

The report begins with a recommendation that the expedition should leave Batavia in August, when they would have the most favourable winds, and have the whole of the summer before them, with long days and good weather. From Batavia the ships should first proceed to Mauritius, then a Dutch possession. As the expedition was intended to go to the east, this, at first sight, seems a strange recommendation. But there were good grounds for the advice. Visscher, as we shall see, had certain reasons for wishing to make the point of departure as far to the west as possible. Mauritius, moreover, was easily reached with the south-east trades, and when there the ships would have run down nearly 1000 miles of their southing, and would have a comparatively short distance to run to the south before reaching the region of the westerly winds, on which they must depend for success. Moreover, at Mauritius, and this is the only reason explicitly stated in the report, they could conveniently take in wood, water, and other supplies necessary for the voyage.

Leaving Mauritius early in October, the ships were to get away south as quickly as possible to 51° or 54° south latitude, or until they fell in with land. From this point they should run due east upon the same latitude to the longitude of the east end of New Guinea, and then steer a course north by west until they got New Guinea on board; or else they might run further to the east to the supposed longitude of the Solomon Islands—or perhaps 500 or 700 miles beyond—then steer north, explore those islands—where, according to all accounts, they would find many things worth their trouble—and return by the north coast of New Guinea to Banda or Amboyna.

But Visscher had an alternative scheme, or rather a combination of two schemes, by which a much more complete exploration could be made. If an exploring expedition was fitted out in Holland, the ships might make the Cape of Good Hope, and thence sail south to latitude 54° S., or make Rio Janeiro, and begin from the east side of Staten Land, near Cape Horn; in either case running east to the longitude of the Solomon Islands, and making the homeward voyage as before. Such a voyage would give a knowledge of the whole Southern Ocean from Cape Horn to the Solomon Islands. Of course if land was met with the plans would be modified, but Visscher apparently had not much faith in the common belief in a huge Southern Continent, at least in the Atlantic and Indian Oceans. About the South Pacific he was more doubtful. Here the difficulty of exploration would be greater. The strong westerly

winds prevailing in the latitude of Cape Horn would make it impossible for any ship to make the voyage to the west in a high latitude; but if the Dutch had a settlement in Chili, the expedition might start from there and run up into the Tropics with the south-east trades to latitude 12° or 15° S., crossing the Pacific in that latitude until it made the Solomons. If they could only be sure of getting refreshment at the Solomons this would be an excellent plan, for they could then sail south from the Solomons, and getting into westerly winds run back east to the Strait of Le Maire and Cape Horn.

By the accomplishment of these two voyages, says Visscher, "You will be able to explore the southern portion of the world round about the whole globe, and find out what is there; whether it be land, or sea, or icebergs—whatever God has ordained to be there." The old pilot's views as to the South Land, and the best means to search for it, show that he was in advance of his time, and free from many of the traditional prepossessions then common amongst navigators and geographers. If the Council of Seventeen could only have been induced to enter into Visscher's plans, the riddle of the South Land might have been solved in the 17th century, and the discoveries of Captain Cook anticipated by more than one hundred and twenty years.

These large schemes were beyond the province of the East India Government, but the plan Visscher had sketched for the expedition from Batavia was adopted in its entirety. Van Diemen in his despatches describes the voyage as having been projected on the advice of Visscher. The resolution of the Governor-General and Council decreeing the expedition is dated 1st August, 1642. It begins by stating the great desire of both the Colonial and Home Governments for the exploration of southern and eastern lands, with the hope of opening up important countries for trade, or at least of finding a more convenient way to the rich countries already known in South America. The Governor then states that he has consulted divers persons of approved judgment in such matters, and especially the renowned and most experienced pilot Frans Jacobsz Visscher, as to the explorations and the best way to accomplish them, and in accordance with their written opinions has decided to despatch for the discovery of these apparently rich countries two ships*, the *Heemskerck*, with a crew of 60 men, and the fly-ship *Zeehaen (Cormorant)*, with 50. The expedition to be under the command of the Hon. Abel Tasman, who is very eager to make the exploration; with him are to

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*The *Heemskerck* was a jagt or small ship, perhaps 200 tons. The *Zeehaen* was a fluit or fly-boat, a vessel of light draught, built for quick sailing; she was smaller than the *Heemskerck*.

be associated the said Pilot-Major Visscher and other capable officers.

The ships were ready for sea. The *Heemskerck* had for skipper Ide Tjercxszoon, the *Zeehaen* Gerrit Janszoon. Tasman as commander and Visscher as pilot-major were on board the *Heemskerck*, Gilsemans the merchant or supercargo on the *Zeehaen*. In all Dutch discovery and trading expeditions the merchant or supercargo was an important personage. He had the direction of the commercial part—which in the Company's voyages was the chief part of the undertaking—and consequently had a large voice in the direction of the expedition. Gilsemans is spoken of as having a competent knowledge of navigation and as being also a skilful draftsman, and it is doubtless to his capable pencil that we owe the vigorous sketches which illustrate the original journal of the voyage.

The instructions to Tasman were printed by Swart in 1859, and are entitled, "Instructions for the Captain-Commander Abel Jansz Tasman, the Pilot-Major Franchoys Jacobsz Visscher, and the Council of the ship *Heemskerck* and fly-boat the *Zeehaen*, destined for the exploration of the Unknown and Discovered Southland, the South-East Coast of New Guinea, with the Islands lying round about." They begin with an elaborate exordium recounting the priceless riches, profitable commerce, useful traffic, excellent dominion, great might and power which the kings of Castile and Portugal had brought to their crowns by the discovery of America by Columbus and of the Cape route to the Indies by Vasco da Gama; likewise what uncounted blind heathen had thus come to the wholesome light of the Christian religion. Yet hitherto no serious attempt had been made by any Christian king, prince, or republic to explore the still unknown part of the globe situated in the south, which might be supposed to be as great as either the old or the new world, and might with good reason be expected to contain many excellent and fruitful countries, and also lands as rich in mines of precious metals as the gold and silver provinces of Peru, Chili, or Sofala. No European colony was so suitable for the starting-point of such an expedition as the town of Batavia, situated in the centre of the known and unknown Eastern India; therefore the Governor and Council of India had resolved to take the discovery in hand, and to despatch for that service the ships *Heemskerck* and *Zeehaen*.

The instructions then prescribe the course which the vessels are to take, following exactly the recommendations of Visscher's report, except that, if the ship's council for any sufficient reason thought is best, they might vary the route by making the east end of the known South Land, or the islands of St.

Peter and St. Francis at the head of the Great Australian Bight, and then sailing due north along the coast (which it was presumed would here turn to the north) to try to discover a passage between it and New Guinea. However, this was not recommended; the course advised being to keep on south latitude 48° to 54° until 400 to 800 miles east of the supposed longitude of the Solomon Islands, so as to be assured that there was a way through from the Indies to the South Pacific which would give a short route to Chili.

Minute directions are given for the survey and description of lands discovered; observation of winds, currents, and weather; precautions to be taken in navigation; discipline and rations of the crews; care in conciliating the natives and avoiding any injury to them; precautions to be observed against possible treachery when landing from boats; and injunctions to obtain information as to the resources of the countries visited, and the possibilities of trade with them.

It must be remembered that this, like other Dutch expeditions, was essentially commercial. It was no scientific or adventurous thirst for discovery that prompted these old Dutchmen, but plain practical business and the hope of profit for the Company. The merchant to whom was entrusted the management of the commercial venture had a large voice in the direction of the expedition. Consequently the instructions are specially precise in their injunctions to enter in the journal full particulars of the productions of the countries, what sort of goods the people had for trade, and what they would take in exchange. For this purpose the ships were laden with a great variety of articles of merchandise. Gold and silver were specially to be sought for, but, says the Governor-General with cynical candour, "Keep them ignorant of the value of the same, appear as if you were not greedy for them; and if gold or silver is offered in any barter, your must feign that you do not value those metals, showing them copper, zinc, and lead, as if those minerals were of more value with us."

Tasman was to hoist his flag on the *Heemskerck* as commander of the expedition, and was to preside in the ship's council, consisting of skippers of the two ships, Pilot-Major Visscher, the chief mates, and the two merchants. The commander had a deliberative and a casting vote. In the administration of justice the boatswains were also to be summoned and have votes. But in all matters which concerned navigation, such as courses to be steered and discovery of lands, the Pilot-Major was to have two votes, and his advice to be held in proper respect, seeing that the voyage had been projected on his advice and information. In these matters, too, the second mates were to have votes.

KAART van de reizen van ABEL JANSZ. TASMAN gedaan in 1642 en 1644; in 1860. uitgegeven door JACOB SWART.

LINGNE ESQVINOCSIALLIS

TROPICVS · CAPRICORNVS

Lingne esquinocsiallis

Tropicus capricornus

COMPAGNIS · NIEV · NEDERLANDt

Anthonio van diemans Landt.

ABEL Tasmans passagie

Abel Tasmans passagie

TE AMSTERDAM, bij de WED.E G. HULST van KEULEN. 1860.

In case of Tasman's death the skipper of the *Heemskerck*, Ide Tjerexszoon, was to succeed to the command.

The Instructions conclude:—"We commend you to the blessing of the Almighty, whom we pray to endue you with manly courage for the accomplishment of the proposed discoveries, and to bring you back in safety, to the increase of His glory, the reputation of the Fatherland, the service of the Company, and your own immortal honour."

They are dated Fort Batavia, 13th August, 1642, and signed by the Governor-General and his Council—Van der Lyn, Maetzuycker, Schouten, Sweers, Witsen, and Boreel.

3. *The Voyage of* 1642.

The next day (14th August) the ships sailed from Batavia, and on this day Tasman's Journal begins as follows:—"Journal or description by me, Abel Jansz Tasman, of a voyage made from the Town of Batavia, in the East Indies, for the discovery of the Unknown Southland, in the year Anno 1642, the 14th August. May it please Almighty God to grant his blessing thereto! Amen."

Sailing through the Sunda Strait, the ships carried the south-east trades with them to Mauritius, where they arrived 5th September, after an exceptionally quick passage of 22 days. An entry in Tasman's journal shows us how hopelessly abroad the best sailors in those days were in regard to longitude. He says, "By our reckoning we were still 200 miles to the east of Mauritius when we saw it." And he mentions the arrival at the same time of another ship, the *Arent*, outward bound, which had made the Island of Rodrigues in the belief that it was Mauritius, because it lay in nearly the same latitude, though 300 miles to the eastward.

They had other difficulties to contend with. A letter from Van der Stel, the Dutch Commandant at Mauritius, to the Governor-General at Batavia, states that the ships arrived in a very bad condition, and wanting almost everything. The *Zeehaen* was partly rotten, and in need of extensive repairs. Both ships were leaky, their rigging was old and weak, their yards and other spars frequently giving way. To refit the ships, caulk the seams throughout, strengthen the rigging, cut and ship spare spars, took the crews nearly a month. Meantime they took in supplies of water, firewood, and other stores; and added to their stock of provisions by shooting wild hogs, wild goats, and other game abounding in the woods. Van der Stel gave to Tasman journals and maps relating to the Solomon Islands, and vocabularies of the languages of those islands and of New Guinea. The ships were ready for sea on

4th October, but, through contrary winds, they could not get out of the harbour of Fort Fredrik Hendrik until the 8th. Taking a departure from the south end of Mauritius,* Tasman stood to the southward, getting variable winds to 31° or 32° S., when he came into the westerly winds. Passing far to the west of St. Paul's and Amsterdam, and between those islands and Kerguelen, he came, in 43° S., on floating seaweed and other indications of land. The ship's council was called together, and it was resolved to keep a man constantly on the look-out at the masthead, and to offer as a reward to whoever should first see land three reals of eight and a mug of arrack, On 29th October, three weeks out, he made 46° S. latitude, and, meeting with strong gales and fogs, thought it too dangerous to keep a southerly course for fear of falling in with land. The course was therefore changed to nearly east. On 6th November, four weeks out, he reached his highest latitude, 49° 4′ S., seeing many indications of land, which kept him anxious.

The Pilot-Major now delivered to Tasman an elaborate paper, in which he carefully discussed the future course of the voyage. He proposed that they should fall off to 44° S. latitude until they had passed the 150th meridian,† when he judged that if they had not made the Southern Continent they would be in an open sea. Then they should fall off to 40° S., and sail east to 220° longitude (about 160° W. according to our reckoning), which he judged would bring them well to the eastward of the Solomons, and enable them to make these islands with the south-east trades—as indeed it would, seeing that this would be about 15° east of the true position of the Solomons.

This resolution was communicated to the *Zeehaen* by enclosing the paper in a wooden case, and floating it astern by a long line for the *Zeehaen* to pick up. The councils of both ships having given their approval, the course was altered accordingly, and on 18th November they passed the longitude of Nuyts Land (Great Australian Bight), the furthest known extension of the discovered South Land. Here they had heavy westerly gales, and gradually fell off to lat. 42° 25′, when on the 24th November, they sighted their first land, which they called Antony Van Diemen's Land, after the Governor-General.

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* As might be expected, Tasman's longitudes are very inexact. They are reckoned east from the meridian of the Peak of Teneriffe. His longitude for the south point of Mauritius, when reduced to the meridian of Greenwich, is 3° 33′ easterly of the true longitude. Similarly, that of Batavia is 4° 23′ too easterly.

† About 130° E. of Greenwich—nearly the longitude of the head of the Great Australian Bight.

This landfall was somewhere to the north of Point Hibbs, on the West Coast of Tasmania, probably near the entrance of Macquarie Harbour—Mounts Heemskirk and Zeehan* being noticeable objects to the north-east. After standing off for the night, the ships next day made the land again, approaching within one Dutch mile (*i.e.*, four English miles) of Point Hibbs. By carefully comparing reckonings the longitude was fixed at 163° 50′,† and a new departure taken. The wind now came easterly with thick weather, so that they could not see the land. Rounding South West Cape they got the wind from the north, and sailed along the south coast. Tasman named the outlying islands and some peaks on the broken coast, which he mistook for islands, after members of the Council of India—Wit, Maatsuyker, Sweers, and Boreel. Passing between Pedra Branca and the main, and rounding the Friars (which he called Boreel Islands), south of Bruni, Tasman stood up for Adventure Bay, but was caught in a violent north-west gale, which drove the ships out to sea. From this incident the bay received its well known name of Storm Bay. Rounding Tasman's Island on the 1st December, he came to an anchor off what is now known as Blackman's Bay, but, which Tasman called Fredrik Hendrik Bay, in honour of the Stadtholder of the United Provinces. His anchorage was off Green Island, near Cape Frederick Henry on Forestier's Peninsula. Next day Pilot-Major Visscher was sent in the *Zeehaen's* boat through the Narrows to explore Fredrik Hendrik (or Blackman's) Bay. On the 3rd, Tasman with two boats made for a little bay, now known as Prince of Wales Bay,‡ but the wind was so stiff from the south-east that the *Zeehaen's* launch with Visscher and Gilsemans on board had to run back to the ship. The *Heemskerck's* longboat with Tasman on board made the bay, but the surf was too high to allow of landing. The carpenter therefore swam through the surf, and planting the Prince's flag on shore, took formal possession of the newly discovered country.

On the 4th December Tasman weighed anchor, intending to sail northwards along the coast and take in water ; the wind, however, was unfavourable, blowing from the north west, and being unable to hold the land aboard, the ship's council resolved to stand away to the east. After naming Maria Island, Schouten Island, and Van der Lyn Island (Freycinet

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* These mountains were so named by Flinders when he made the first circumnavigation of Tasmania in the *Norfolk* in 1798.

† East from Teneriffe.

‡ Mr. Gell thinks that this Prince of Wales Bay is the Fredrik Hendrik Bay of Tasman.

Peninsula), he took his departure from "a high round mountain"—probably St. Patrick's Head, or perhaps St. Paul's Dome.*

Steering due east from the coast of Antony Van Diemen's Land, after nine days he sighted land again (13th December). This was the west coast of the South Island of New Zealand, to the south of Cook's Strait.

In an interesting paper by Dr. T. M. Hocken, of Dunedin, on Tasman's discoveries in New Zealand, it is stated that "the great high land" that Tasman first saw is situated between Hokitika and Okarito. Further north the low point described in the journal is Cook's Cape Foulwind, with its outlying rocks, the Steeples, near Westport. North of this the Karamea Bight, and the "furthermost point, which stood out so boldly that we had no doubt it was the extreme point," is Cook's Cape Farewell.

Coasting north-eastwards he made a bay on the north coast of the South Island, where he anchored. Here the Maoris in their war canoes attacked one of the *Zeehaen's* boats, killed three of the crew, and mortally wounded a fourth man. Tasman gave this bay the name of Moordenaars (or Massacre) Bay. He says, "This is the second land we have discovered; we have given it the name of the Staten Land in honour of Their High Mightinesses the States General, and also because it may be that this land is joined to Staten Land (near Cape Horn), but this is uncertain. It appears to be a very fine country. Believing that this is the main continent of the Unknown Southland, we have given this strait .the name of Abel Tasman's Passage, as he has been the first to sail through it."†

Massacre Bay is near the western entrance of Cook's Strait; it is now called Golden Bay, and the scene of the tragedy, according to Dr. Hocken, lies close to Parapara.

Although Tasman noted a south-east current and suspected that there must be a passage, the weather was so bad that he did not stay to look for it; if he had done so he would have sailed through Cook's Strait and corrected his idea that he had found the Great Southern Continent. However, he sailed

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* Tasman's longitudes, reduced to the meridian of Greenwich, are for Point Hibbs, 147° 11′; for the anchorage off Green Island, 150° 51′. The true longitudes are 145° 15′ and 148° 1′ respectively. The first shows an error of 1° 56′, the second an error of 2° 50′, thus making Tasmania too broad by nearly one whole degree of longitude.

In the Papers and Proceedings of the Royal Society of Tasmania for 1890, is a paper by the present writer, in which the localities mentioned by Tasman in his journal are identified and described.

† The English Admiralty has lately given to the sea between Australia and New Zealand the name of the *Tasman Sea*.

north along the west coast of the North Island and sighted the Three Kings Islands, on which they would have landed to get fresh water, but were deterred by seeing thirty or forty men of uncommon stature who showed themselves in a threatening attitude. He did not land in New Zealand, partly on account of bad weather and partly owing to the hostile attitude of the Maoris. After rounding the north of New Zealand he steered north-east after consultation with the ship's council, and found a great swell from the south east, which must have made him doubt the existence of the Great Southern Continent. It did indeed assure him that here was a clear passage from Batavia to Chili. Still holding a north-east course, on 21st January he came to several islands, to which he gave the names of Amsterdam, Middelburg, and Rotterdam, now known as Tongataboo, Eooa, and Annamooka, part of the Tonga or Friendly Group. He was very hospitably received by the natives, and after a few days' stay he weighed anchor (1st February), and after discovering Willems' Shoals, south east of Fiji, by the advice of Visscher and the council he stood north by west to 5° or 6° S. lat., and then west for New Guinea. He sailed along the north coast of New Guinea, and arrived at Batavia on 15th June, 1643, after an absence of ten months, during which he had lost ten men by sickness, besides the four men killed by the Maoris. His journal concludes thus: "God be praised and thanked for a safe voyage! Amen."

4.—*The Voyage of* 1644.

Tasman had not, as Van Diemen had hoped, discovered any rich gold or silver mines, or indeed any rich trade for the Company, but he had circumnavigated New Holland, or, as he called it on his chart, "Compagnies Nieuw Nederlandt," and had found a clear way to Chili, which opened up a good prospect for trade, or at least for great spoil to be come at from the Spanish settlements in South America. From this last Governor-General Van Diemen hoped much. On 4th January, 1644, he wrote to the Home Directory that he contemplated fitting out a fleet in September to open up a Chili trade and to plunder the Spaniards in Peru. He also intended to send two or three ships to make an examination of the newly discovered South Land, which Tasman had not found possible. For he hoped that such great countries must contain much that would be profitable to the Company, and especially gold and silver mines, as in Peru, Chili, and Japan. But, in the meantime, it would much facilitate the attempts on Chili and Peru if a shorter passage could be found between New Guinea and the Known South Land. This the Governor-General announced

was to be immediately undertaken by two ships and a smaller vessel under the same commanders as before, viz.—Commander Tasman and Pilot-Major Frans Visscher; Gilsemans was again to be merchant or supercargo.

On 13th January, 1644, by resolution of the Governor-General in Council, the ships *Limmen* and *Zeemeeuw (Sea Gull)*, with the little tender *Braek (Setter)* carrying only 14 men, were commissioned for the work. They carried a complement of 111 hands, and were provisioned for 8 months. On 29th January the instructions for the voyage were drawn up and signed. They were printed in England by Mr. Major in 1859.* They contain a most interesting and valuable summary of former Dutch voyages and discoveries in the South Land. The vessels were to coast along the south and west coasts of New Guinea to the furthest discovery in 17° S. lat. (*i.e.*, in the Gulf of Carpentaria) and endeavour to find a strait or passage into the South Sea. If a strait was found, which might be known by the south-east swell running through it, they were to sail through it and thence as far to the south-east as the new Van Diemen's Land. From thence they were to make the islands of St. Peter and St. Francis, and run along the coast of the Known Southland to DeWit Land, in 22° S. lat., when the Known Southland would be circumnavigated and be found to be the largest island in the globe. But if, as was to be presumed, New Guinea was joined to the South Land, forming one continent, then they were to run along the coast to 28° S. to the Land of Eendragt and Houtman's Abrolhos, and thence return to Batavia.

The ships sailed from Batavia next day, (30th December, 1644). The journals of the voyage are lost, and we have only the briefest notices of the expedition.† But Tasman's chart shows the route of the ships. For some reason or other, probably on account of the wind, Tasman and Visscher did not follow the instructions exactly. Instead of sailing first to New Guinea they made a straight course to the Land of Eendragt. From thence Tasman coasted northwards, and carefully charted, with soundings, the west and north coasts of Australia, including the Gulf of Carpentaria. He actually got into the mouth of Torres Strait, but did not discover the passage. Probably he was deterred from further examination by the multitude of islands and reefs that block the way, and was, moreover, ignorant of the fact that the Spaniard Torres

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* Early voyages to Terra Australis.—Hakluyt Society, 1859.

† N. Witsen: "Noord en Oost Tartarye," translated by R. H. Major, in "Early Voyages to Terra Australis," pp. 91–98. The journal has been sought for in vain both in Holland and at Batavia, especially by Messrs, Van der Chijs and Norman in 1862.

had in 1606 sailed through the strait from the east. Failing to find the strait he returned along the south coast of New Guinea to Batavia, where he arrived in August, 1644.

Van Diemen in his despatch to the Home Directory, the Council of Seventeen, (23rd December, 1644), reports the result of the voyage, and expresses his discontent and disappointment that the expedition had not discovered a strait between New Guinea and the Known South Land, but only a great bay or gulf, and also that they had done nothing but sail along the coasts, and had gained no knowledge of the country and its productions, alleging as a reason that they were not strong enough to venture to land in face of the savages. This was very disappointing, since discoveries were of little use unless the country was explored at the same time. "For it is certain that so long as we merely run along the coasts and shores we shall very slowly open up anything profitable, it being well known to everybody that the coast people are ordinarily poor, miserable, and evil disposed; therefore, we must go inland." (Letter: 29 Nov.) Yet, he says, Tasman in his two voyages had circumnavigated the hitherto Unknown South Land, which was calculated to have an extent of 8000 miles of coast; and it was very improbable that in so great a country, with such a variety of climates, there should not be found something of great importance and profit for the Company. There were also the great northern lands of America, which had been made accessible by the new discoveries, and every opportunity would be taken to explore them from time to time by vigilant and courageous persons; "for," says Van Diemen, "the discovery of new countries is not work for everyone." "God grant," he concludes, "that in either one or the other [*i.e.* in North America or the South Land] may be found a rich silver or gold mine, to the satisfaction of those engaged in the venture, and to the honour of the finders."

It is plain that Van Diemen was dissatisfied with Tasman. He had looked for immediate results in the extension of trade, or at least for the finding of the New Guinea strait, and, disappointed in this, he could not appreciate the importance of the discoveries from a geographical standpoint.

Tasman's services were recognised somewhat grudgingly. By resolution of the Governor-General and Council (4th Oct., 1644) his salary was raised to 100 florins (£9 6*s.* 8*d.*) per month, and the reasons are stated in measured language:— "In which two voyages (of 1642 and 1644), he has given us reasonable contentment in respect of his services and the duties he has accomplished. It is therefore on account of this, at his request, and in consideration of his ability, also by reason of his having been again about six years in the country; and,

moreover, that we find in him the spirit to render further good service to the General Council on like occasions in searching for rich countries and profitable trade."

IV.—Tasman's later Years, 1644–1659.

Tasman's failure to find what the Governor-General and the East India Company wanted—immediate and profitable trade—seems to have brought him under a cloud. He remained at Batavia, but without any important employment. In October, 1644, he and Frans Visscher laid down a route for an expedition fitted out to attack the Spanish ships coming from America to Manilla. But Visscher only was employed on the expedition, and Martin de Vries in a subsequent one. Tasman was passed over.

Governor-General Van Diemen died in 1645, and with him the era of great discovery expeditions closed. His successors in the government were not animated by the same zeal for exploration and adventure, but devoted their attention to strictly commercial matters, and Tasman found small opportunity for distinguishing himself. He was not wholly neglected. He was appointed (2nd November, 1644) a member of the Council of Justice at Batavia. It seems a somewhat inappropriate post for a sailor, but the special functions allotted to him may explain the appointment, for the resolution proceeds, "Commissioning and qualifying the said Tasman to demand and search for the journals of all incoming ships, and to report to us therefrom what is proper." He still held this post in December, 1646, but this did not prevent his occasional employment on more important and doubtless more congenial expeditions. Thus, in September, 1646, we find him sailing as Captain Commander in a mission to Djambi in Sumatra, and in August, 1647, going to Siam charged with letters from the Company to the King. He still kept up his relations with the Home Country, as there is mention on more than one occasion of his remitting sums of money to Holland. That he was a man of good repute amongst his fellow citizens is evidenced by the fact that in January, 1648, he was elected an Elder of the Reformed Congregation at Batavia.*

After four years of comparative inactivity, he was once more entrusted with an important expedition. On 14th May,

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* The Church Consistory at Batavia was a body which exercised a great influence in the Dutch East Indies. During the time Tasman sat as a member, a subject much discussed by the Consistory was a proposal for the suppression of Chinese idolatry, the destruction of all Chinese temples, and the punishment of the Priests. In April, 1648, the Consistory sent a Missionary, Dr. Hambroek, to Formosa, where he was shortly afterwards killed by the natives.—(Lauts, p. 290.)

1648, he took command of a fleet of eight ships, with 1150 men, which was to proceed to Manilla to lie in wait for the Spanish silver ships from America, to do what mischief it could to the enemy, and afterwards to sail to Siam. A further object was the suppression of the Chinese trade to Manilla and the extension of the Company's monopoly. The expedition was expected to accomplish great things for the Company. The Governor-General gave a dinner party to the officers on the eve of their departure, and the fleet left Batavia confident of success. The result did not justify their hopes. A descent was made on the island of Luzon (or Manilla), a number of villages and monasteries were pillaged and destroyed, and a rich booty carried off, but the main object of the enterprise was not accomplished. The Chinese trade was not suppressed, neither did the Dutch fleet capture the silver ships. One of the Dutch vessels was wrecked in a storm, and the Spanish ships contrived to escape. Tasman reached Siam in November, and the conclusion of the Peace of Westphalia, which brought to an end the Eighty Years War between Spain and the United Netherlands, put a stop to further hostilities.

The fleet returned to Batavia in January, 1649. An incident had occurred during the expedition which led to Tasman being tried before the Criminal Court, 23rd November, 1649. It is interesting, as giving us one of the few personal glimpses we have of the man, and as showing the severity with which the Company visited the delinquencies of their most valued officers, and vindicated the right of their meanest servants to a fair trial even in war time. It must be confessed that the incident does not present our navigator in a favourable light. According to the statement of the Advocate Fiscal, or prosecuting counsel, the facts were as follow:—In August, 1648, Tasman had landed at the Baviauw Islands with a military force, and had pitched a camp. He had issued orders that no one was to go outside the limits of the camp under pain of capital punishment. On the next day, "after he and some of his officers had all day been making good cheer at a certain monastery," on their return in the evening they came upon one of the supernumeraries and another sailor rambling outside the camp. Tasman was furious. He ordered the delinquents to be seized, and sentenced them to be hanged on the spot. He himself prepared the rope, and put it round the neck of the supernumerary, and made his Vice-Commander, Ogel, climb a tree and make fast the rope. This done, Tasman himself drew away the bench on which the man was standing, and left him hanging from the tree. He then made a rope ready for the second man. Luckily Ogel let go "the patient," but only just in time. Tasman made some defence,

but the Court set it aside, and decided that not even the exigencies of war could excuse the Commander for hanging a man without a trial. The punishment inflicted was exemplary. Tasman was sentenced to be suspended from his office of Commander during the Governor-General's pleasure, to pay a compensation of 1000 reals to the relatives of the sailor, a fine of 150 reals, and the costs of suit. In addition to this, he was to stand bareheaded in open Court, and publicly declare that he had unjustly and unlawfully, without form of trial, of his own mere pleasure, and with his own hands, infamously executed the aforesaid innocent Coenraad Janssen of Amsterdam. It would appear that he was at the same time removed from his office in the Church Consistory—at least his name does not appear in the list of elders for the ensuing year.

The suspension from office lasted two years. In October, 1650, we find him again employed as Commander, and on the 5th January, 1651, by a resolution of the Governor-General and Council of India, he was formally reinstated in his rank, his reappointment to date from the 24th September preceding, when it is said he had again began to serve the Company.

After this time we have little information about him. It would appear that he considered his services were not sufficiently recognised, or at least that he had grievances which he laid before the Council of Seventeen in Holland. In October, 1651, the Directors ordered that a letter of complaint from Abel Jansz Tasman be enquired into and reported on, but the result of the enquiry does not appear. In January, 1653, he wrote again to the Directory, the Colonial authorities curtly noting in the margin, "Abel Jansz Tasman fails to prove his rash assertions." Whatever his grievance was, it is evident that he failed to obtain satisfaction, and that it led to his retirement from the Company's service. The daily journal of Fort Batavia two months later records, under date 15th March, 1653, the arrival at Djapara of "Ex-Commander Tasman" in his own private vessel.

Of his last days we know nothing, except that he was a substantial and well-to-do citizen of Batavia, living just outside the town on the Tygersgracht (Tiger Canal), one of the best and wealthiest quarters, and that he had considerable landed property. There were only a few larger landholders in the town, amongst them François Caron, Chief Councillor for India and Director-General, who has been mentioned as head of the Dutch Factory in Japan in 1640. Lauts found from a contemporary map of Batavia that Tasman owned a pleasure garden of nearly six acres in one quarter, and no less than 282 acres on the Tiger's Canal, where he resided. Nieuwhoff,

who was in the Indies from 1654 to 1670, says that the handsomest buildings in Batavia were situated on the Tiger's Canal, which was planted on both sides with fine trees. Valentyn says: "The view of this straight canal, so beautifully planted, surpasses anything I have ever seen in Holland."

On 10th April, 1657, Tasman made his will, which is still preserved in the Registry of the Probate Court of Batavia. It opens with the quaint old formula, "In the name of God, Amen!" and states that the testator is up and about, sick in body, but having good memory and understanding, and being used to think upon the shortness of life, that there is nothing more certain than death, and nothing more uncertain than the hour of the same, he has therefore resolved to make a solemn testament. First he beqeaths twenty-five guilders to the poor of Luytgegarst, his native village; secondly to Abel Heylman, his daughter's son, living in Batavia, a gold cup and silver-mounted sword. All the remainder of his property he gives to his beloved wife, Joanna Tjercx. If however she marries again, half of her bequest is to go over to the children of his only daughter, Claesjen. If his daughter or her children dispute the will, or require accounts from the widow, then their half share is to be reduced to one-fourth (the ordinary legal portion of a child). After his widow's death the half is to fall to the children of Claesjen; but as to the widow's half she may use and treat it as her own free property without contradiction of any.

Tasman had no children by his second wife, Joanna Tjercx. Claesjen was the daughter of his first wife, Claesgie Heyndricks. Claesjen had been twice married and had children by both husbands. The first, Philip Heylman, held an important office in the Fort; the second, Jacob Breemer, was an officer of the Probate Court of Batavia.

In October, 1659, the will was deposited in the Probate Court of Batavia; so that Tasman must have died in that year, fifteen years after his second great voyage.

The great navigators have seldom been long lived. Magellan and Cook died at fifty-one, Vasco da Gama at fifty-six. Tasman reached the latter age.

His widow, though forty-seven years old at her husband's death, did not long remain unconsoled. Eighteen months later, under date 5th February, 1661, the daily journal of Batavia records that permission was granted for the marriage of Jan Meynderts Springer, burgher of Batavia, to Madame Anna Tjerks, widow of the deceased Commander Abel Tasman, to be celebrated at her sick bed in consideration of her severe illness; Springer to pay to the Church a hundred reals of eight for the privilege.

It remains to mention the well-known story of Tasman's supposed attachment to a daughter of Governor-General Van Diemen, evidenced by his naming various places, *e.g.* Cape Maria Van Diemen, Maria Island, Maria Bay at Tonga. Flinders first suggested this little romance in his Voyage to Terra Australis, published in 1814. It pleased the fancy of the French geographer Eyriès somewhere about 1820, and has been repeated and enlarged upon for some eighty years.

It is a pretty story, but unfortunately for the romance it has not the slightest foundation. In the light of recent investigations Tasman appears as a twice-married man of middle age, with a grown-up daughter. But this is not conclusive. Perhaps the next argument against the story is more cogent: Van Diemen had no daughter. If, however, anyone is still unconvinced, we may clinch the argument with the express statement of Tasman attached to one of the drawings in his Journal:—"We have named this bay Maria Bay in compliment to the wife of Governor-General Van Diemen." If anyone after this requires further proof, let him consult the papers of the Dutch East India Company, or continue to write sentiment on the ardent young sailor's unrequited love.

To conclude. Tasman's discoveries, great as they were from a geographical point of view, bore no fruit for more than a hundred years. His tracks were marked on the charts, but as to the countries he discovered, his countrymen in the East Indies, whose sole object was trade, felt no temptation to explore the wild bush of Van Diemen's Land, or to face the fierce tribes of Massacre Bay, or even to plant colonies on the barren and inhospitable shores of Western Australia peopled by naked savages. Only the Englishman Dampier in 1688, and again in 1699, visited the western coast, and was glad to leave what he described as the most miserable country on earth. Had Tasman but discovered the way through Torres Strait, it is possible that New South Wales might have been colonised by the Dutch. It was reserved, however, for an English navigator, more than a century after Tasman's voyage, to make the practical discovery of Australia as a land for European colonisation. When Captain Cook in his first famous voyage in the *Endeavour*, on Sunday, 29th April, 1770, cast anchor in Botany Bay, the Australian Continent was first laid open to European enterprise; eighteen years later Sydney was founded by Englishmen. Would that the first planting of these Colonies had been other than it was, and that the wise warning of Lord Bacon had been heeded; for, says he—"It is a shameful and unblessed thing to take the scum of the people and wicked condemned men to be the people with whom

you plant; and not only so, but it spoileth the plantation, for they will ever live like rogues and not fall to work, but be lazy, and do mischief, and spend victuals and be quickly weary, and then certify over to their country to the discredit of the plantation." All which things were verified in the early history of these Colonies. But Australia "has burst her birth's invidious bar, and grasped the skirts of happy chance; breasted the blows of circumstance, and grappled with her evil star; has made by force her merit known, and lived to clutch the golden keys." A hundred years growth has now made Australia well nigh a nation; but as yet it is a nation in the gristle only. When the petty jealousies of the Colonies are laid aside, and when the several States—as we hope may soon be the case—are united in one great Federation, we may feel a perfect confidence that, amongst the children of the old English mother, not the least important will be those dwelling in the island Continent circumnavigated by Tasman two hundred and fifty years ago, who will claim the title of Citizens of the Commonwealth of Australia.

BIBLIOGRAPHICAL NOTES.

Maps of the Voyages, 1642 and 1644.

Manuscript Maps.

1. In the collection of Van Keulen of Amsterdam. A large and handsome map on Japanese paper, showing both voyages. Mr. Leupe thinks it to be the work of Pilot-Major Visscher. Australia bears the name of *Compagnis Nieu Nederlandt.* This map was reproduced in coloured facsimile in Mr. Swart's edition of the complete journal published in 1860.
2. In the British Museum. Sloane MSS. 5222, Art. 12. A large sketch map, roughly executed, showing both voyages. In the centre of Australia is written "This large Land of New Guinea was first discovered to joyne to ye South Land by ye Yot Lemmen as by this Chart Ffrançois Jacobus Vis. Pilot Maior Anno 1643." Mr. Major, who gives a reduced copy of this chart in his *Early Voyages*, thinks it to be a copy of a map by Visscher, and that it was made by Captain Thomas Bowrey, of Fort St. George, about 1687. Mr. Alfred Mault, of Hobart, has made a facsimile of the original map, and this has been photo-lithographed for the Royal Society of Tasmania.
3. In the India Museum, South Kensington. A coloured chart of the coast of Van Diemen's Land, endorsed in an old hand: "A Draught of the South Land lately discovered, 1643." Mr. A. Mault found this chart amongst the Records of the India Office. He contributed to the Transactions of the Australasian Association for the Advancement of Science, 1892, a description of this map with coloured facsimile.

Early Maps.

In 1648, four years after Tasman's second voyage, the building of the new Stadhuis, or Town Hall, of Amsterdam was begun. The opportunity was taken to commemorate Tasman's discoveries by showing them in a great map of the world in two hemispheres, cut in the stone pavement of the Great Hall (Burgerzaal) of the Stadhuis. This pavement has long since been boarded over.

Mr. Major says that an outline of the coast visited by Tasman is given in Turquet's Mappemonde, published in Paris in 1647; also in the 1650 edition of Janssen's Atlas, and in the 1660 edition of J. Klencke's Atlas. The discoveries are also shown in Fredk. de Wit's map, published in 1660; and a representation of the hemispheres is given in the fine work describing the Stadhuis, and published in 1661. The map in Thévenot (1663) is from the Stadhuis pavement, but with names added. Some of the published maps contain the names Hollandia Nova and Zeelandia Nova.

Manuscripts of the Journal of 1642.

Mr. Leupe describes three contemporary manuscripts which are preserved in Holland :—

1. R.A. 1. In the State Archives at the Hague. Consists of 28 double folio leaves, bound in a volume which forms part of a collection made by Cornelis Sweers. It is badly written and kept in a slovenly manner, probably by a young officer on board the *Heemskerck*.
2. R.A. 2. In the State Archives. In a large folio volume containing 196 pages, very neatly written, with a large number of charts and drawings, some coloured. It bears the autograph signature of Tasman, and is apparently a fair copy of the official journal kept on board the *Heemskerck*. It is probably the manuscript used by Valentyn in compiling his account. He reproduced most of the maps and sketches. This manuscript, with the charts and drawings, is to be reproduced in facsimile in Messrs. Fred. Muller & Co's. forthcoming edition.
3. H. v. M. In the possession of Mr. Huydecoper van Marsseveen. In a folio volume, smaller than R.A. 2, contains 112 pages, neatly written, with three small charts and some sketches. It also is a copy of an original journal, and is not signed. It has some particulars not given in R.A. 2. It is from Cornelis Sweers' collection.

The following manuscripts are also known :—

4. Brit. Mus. 8946. Plut. C.L. xxii. D. In the British Museum. It is carelessly written, and contains 38 charts and sketches. Probably a copy of R.A. 2. This manuscript was bought in London at Mr. Lloyd's sale, some time before 1776, for half-a-guinea, and was subsequently acquired by Sir Joseph Banks. In 1776 Banks employed the Revd. Charles G. Woide, Chaplain of the Dutch Chapel at St. James's, to translate it. Woide's translation was used by Captain Burney in his work. About 1868 the late Mr. J. E. Calder published in the *Tasmanian Times* the account of the discovery of Tasmania taken from Burney.
5. Amongst the hydrographical documents belonging to the publishing firm of Van Keulen of Amsterdam, there was formerly a manuscript copy of the Journal. It was probably a copy agreeing with R.A. 2, and, it is said, bore Tasman's signature. Mr. Swart printed the complete Journal from this copy, 1854-59.
6. Mr. Lauts mentions that a manuscript copy of the Journal was bought by the bookseller Bom, of Amsterdam, in 1835.

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Principal Collections of Voyages containing an abstract of the Journal of 1642.

1. Nierop, Dirck Rembrantsz van—Een kort verhael uyt het journaal van der kommander Abel Jansen Tasman in 't ontdekken van 't onbekende Suit Landt in 't jare 1642. (A short account from the journal of Commander A. J. Tasman on the discovery of the unknown South Land in the year 1642). 4to. Amsterdam, 1669-74.*
   [The first published abstract of the Journal. Nos. 2 to 9, are translations of this.]
2. Hooke, Dr. Robert—Philosophical Collections. 4to. London, 1678.*
3. Thévenot, Melchisedek—Relation de divers voyages curieux. Nouvelle edition. 2 vols., fol.: Paris, 1696.
   [The first edition 1663-72 contains the map only. The voyage was printed as a supplement, circa 1681.]
4. An Account of several late Voyages and Discoveries. 8vo: London, 1694. 2nd edition, 1711. [Narbrough's Voyage, &c.]
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6. Campbell, Dr. John—Navigantium atque itinerantium bibliotheca, by John Harris. 2 vols, fol.: London, 1744-48. [With notes and map].
7. Voyages de F. Coreal aux Indes Occidentales. 3 vols., 12mo: Amsterdam, 1722: Paris, 1738. [The voyage is appended as a supplement].
8. Brosses, Charles de—Histoire des Navigations aux Terres Australes. 2 vols., 4to: Paris, 1756. [With Vaugondy's map of Australasia].
9. Callander, John—Terra Australis Cognita. 3 vols., 8vo: Edinburgh, 1766-68.
10. Valentyn, François—Oud en Nieuw Oost-Indien (Old and New East Indies), 5 vols., fol.: Dordrecht, 1724-26. [A much fuller account taken from the original journal, with reproductions of many drawings and maps].
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12. Du Bois, J. P. J.—Histoire générale des Voyages. 25 vols., 4to: The Hague, 1747-80. [De Hondt's Collection].
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14. Dalrymple, Alexander—Historical Collection of the several Voyages and Discoveries in the South Pacific Ocean. 2 vols., 4to: London, 1770-71. [The text is taken from Valentyn, collated with Nos. 2, 3, 4, 6, and 12].

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Anthony Van Diemens Landt

Dit is beseijlt ende ondeck met de Scheepen Heemskerck ende Zeehaen
Onder het Commande Vanden E: Abel Tasman Inden
Jare 1642 Den 24 Nouwember. 8.

Wits Eijlanden
Sowers Eijlanden
Maet Suickers Eijlanden
Berels Eijlanden
Stoormbaij
De Zuijd Cap
Frederick Henricx Baij
Marias Eÿlandt
Schoutens Eÿlandt
Vanderlins Eylandt
Tasmans Eylant
Tasmans Parsage
Pedra Branca
Verhoent als een plomp in Zeen

41 42 43 44
162 163 164 165 166 167 168 169 170

APPENDIX.

THE DISCOVERY OF TASMANIA.

From Tasman's Journal, 1642.*

23rd November.†—Good weather, and the wind S.W., with a fresh gale. In the morning found that our rudder-head was broken in two in the tiller-mortise; whereupon lay to under shortened sail, and put a plank on either side. Noon, found our latitude 42° 50′, and longitude 162° 51′. Course held E., and sailed 25 (100) miles. Here found one degree north-westerly variation, which here decreases very rapidly. According to our reckoning had the west side of *Nova Guinea* to the north of us.

24th November.—Good weather and clear sky. Noon, found latitude 42° 25′, and longitude 163° 31′. Course kept E. by N., and sailed 30 (120) miles. The wind from the S.W., and afterwards S., with a gentle top-gallant breeze. Afternoon, about 4 o'clock, saw land. Had it E. by N. from us 10 (40) miles by our reckoning. It was very high land. Towards evening saw in the E.S.E. three high mountains, and in the N.E. also saw two mountains, but not so high as those to the south. Here had a true pointing compass. In the evening, in the first glass when the watch‡ was set (8 P.M.), proposed to the council of our ship with the under mates, whether it would not be best to stand off the shore to sea; and required their opinion, when they thought this to be most advisable. Whereupon unanimously approved after 3 glasses (9·30 P.M.) to lie out from the shore and run from it 10 glasses (5 hours), when we should stand back to the land: all more fully appearing in the resolution of this date to which we refer. At night, after 3 glasses (1½ hours), the wind was S.E. Tacked from the shore, and sounded in 100 fathoms, clean white fine sand with small shells; afterwards sounded again, and had black coarse sand with small stones. At night had the wind S.E. with gentle breeze.

25th November.—Morning, nearly calm. Hoisted the white flag and the flag at the mizzen-top-gallant-mast, whereupon

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* Translated from Swart's edition of the Journal, with notes, &c., published at *Amsterdam* in 1860. A strictly literal translation has been preferred, as giving a better idea of the quaintness of the original.

† The days are reckoned from midnight to midnight. The longitude is calculated from the meridian of the *Peak of Teneriffe*.

‡ The first watch was from 8 P.M. to midnight. A half-hour sand-glass was used to measure the time.

the officers of the *Zeehan* with their mates came on board us, when we called the council and resolved with them, as is to be seen by the resolution of this day, and is there set out at length, to which we here refer. Towards noon got the wind S.E., and afterwards S.S.E. and S. Tacked for the shore. In the evening, about 5 o'clock, came under the shore. Three miles (12) out from the shore had 60 fathoms, coral bottom; 1 mile out (4 miles) had clean fine white sand. Found this coast stretching S. by E. and N. by W., a smooth [bare] coast, and had reached latitude 42° 30′, and mean longitude 163° 50′. Tacked again from the shore. The wind blew S.S.E., top-gallant breeze. When you come from the W. and find that you have 4° north-westerly variation, then you may look out for land, because the variation here decreases very rapidly. If it happens that you get rough weather from the westerly quarter, then you may well lie to, and not sail ahead. Here on the coast you have a compass pointing true. We have also the mean longitude, which we determined by each working out his reekoning and taking the mean. Wherefrom we find this land to be in the longitude of 163° 50′.

This land is the first land in the *South Sea (Zuytzee)* that we have met with, and is yet known by no European nations. So we have given this land the name of ANTHOONY VAN DIEMENSLANDT, in honor of the Most Honorable the Governor-General, our High Master, who sent us out to make these discoveries. The islands lying round about it, as many as are known to us, we have named after the Honorable Members of the Council of India, and may be seen on the small chart made thereof.

[Here there are in the manuscript some sketches of land, of which two are found in VALENTYN, p. 48, No. 1A and No. 5E. The other, No. 5E, I have not found in the manuscript.—JACOB SWART.]

26th November.—Had the wind easterly, gentle breeze, hazy weather, so that we could not see land. Reckoned we were about $9\frac{1}{2}$ (38) miles from the shore. Towards noon, hoisted the flag at the main-top-gallant-mast, whereupon the *Zeehaen* immediately came up under our stern, when we hailed her people that Sr. GILSEMANS should come aboard. Whereupon the said GILSEMANS without delay came on board us, and we made known to him the matters which are mentioned in the under-written note, and are to be taken with him to his ship, in order to show the same to the Skipper, GERRIT JANSZ, and also for orders to their mates.

"The officers of the fly-ship *Zeehaen* shall in their daily log describe this land, which we saw yesterday and are now near,

as in longitude 163° 50′—because by mutual reckoning we find it thus, and this longitude as settled—and begin to reckon the longitude afresh from thence. He who before this has longitude 160° or more, shall now make his reckoning from that land. This is therefore done in order to avoid all mistakes as much as is in any way possible. The officers of the *Zeehaen* shall give the same charge to the mates, and shall also observe it, because we find this to be fitting; and the charts which are hereafter made by any one shall lay down that land in the mean longitude as before stated of 163° 50′.

"Given on the *Heemskercq*, date as above.

"(Undersigned) ABEL JANSZ TASMAN."

Noon, reckoned we were in S. latitude 43° 36′, and longitude 163° 2′. Course kept S.S.W., and sailed 18 (72) miles. Had half a degree north-westerly variation. Got the wind N.E. Set our course E.S.E.

27th November.—Morning, saw the coast again. Our course was still E.S.E. Noon, reckoned we were in S. latitude 44° 4′, and longitude 164° 2′. Course held S.E. by E., and sailed 13 (52) miles. It was drizzling, misty, hazy, and rainy weather; the wind N.E. and N.N.E., with gentle breeze. At night, after 7 glasses in the first watch (11·30 P.M.), lay to under shortened sail. We dared not sail on, by reason that it was so dark.

28th November.—Morning, still cloudy, misty, rainy weather. Made sail again. Set our course E., and afterwards N.E. by N. Saw land N.E. and N.N.E. from us, and stood straight for it. The coast here stretches S.E. by E. and N.W. by W. This land runs away here to the east so far as I can observe. Noon, by reckoning in latitude 44° 12′, and longitude 165° 2′; and course held E. by S., and sailed 11 (44) miles. The wind from the N.W., with gentle breeze. In the evening came under the shore. There are under the shore some small islands, one of which looks like a lion. This lies about 3 (12) miles out to sea from the mainland. Evening got the wind E. At night lay to under shortened sail.

29th November.—Morning, were still near the rock which looks like a lion's head.* Had the wind westerly, with top-gallant breeze. Sailed along the coast, which here stretches east and west. Towards noon passed two rocks, the most westerly looking like *Pedra Branca*, which lies on the coast of *China*; the most easterly, looking like a high rugged tower, lies about 4 (16) miles out from the mainland. Ran through between these rocks and the land. Noon, reckoned we were in latitude 43° 53′, longitude 166° 3′. Course held E.N.E., and sailed

* The *Mewstone*.

12 (48) miles. Still sailed along the shore. In the evening, about 5 o'clock, came before a bay.* It seemed that we would likely find a good anchorage there. Wherefore resolved with our ships' council to run into it, as appears by the said resolution. Were almost in the bay when there presently arose such a violent wind that we were obliged to take in our sails and run back to sea under shortened sail, because it was impossible with such a wind to come to an anchor. In the evening resolved to stand out to sea for the night under shortened sail that we might not fall on a lee shore in such a storm. All which is to be seen more at large in the above-mentioned resolution, whereto (to avoid prolixity) we here refer.

Ultimo November.—Morning, at dawn, tacked to the shore. Had been driven off from the shore so far by wind and current that we could scarcely see land. Did our best to approach it again. Noon, had land N.W. from us; tacked to the west, the wind northerly, but not serving us to fetch the land. Noon, found latitude 43° 41′, longitude 168° 3′. Course held E. by N., and sailed 20 (80) miles, with stormy and unsettled weather. Here the compass showed true. A little after noon tacked to the west, with hard unsteady breeze. Tacked to the north under shortened sail.

Primo December.—Morning, weather somewhat more moderate. Set our topsails; the wind W.S.W., with top-gallant breeze. Steered our course for the shore. Noon, found latitude 43° 10′, and longitude 167° 55′. Course held N.N.W., and sailed 8 (32) miles, and was almost calm. At noon, hoisted the white flag, whereupon our friends of the *Zechaen* came on board, when we resolved together that it would be best and most expedient, if wind and weather but permitted, to get on land, the sooner the better, so as to obtain a nearer knowledge of its situation, and also to see what refreshments were to be had, as the resolution of to day shows more at large. Afterwards got a little breeze from the eastward. Ran towards the shore to examine whether some good anchorage can be got hereabouts. About an hour after sunset let go the anchor in a good harbour, in 22 fathoms, between white and grey fine sand, good holding ground; for which we must show thankful hearts to Almighty God.

[Here in TASMAN'S Journal is the little map found in VALENTYN, pp. 48, 49. The degrees of longitude in VALENTYN differ one whole degree from those in TASMAN'S Journal. Also the two little ships of the latter are not found in the little map in the Journal.—JACOB SWART.]

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* *Storm Bay*, or rather, *Adventure Bay*.

2nd December.—Early in the morning sent the Pilot-Major, FRANCOY JACOBSZ, with our long-boat (*chaloup*), with 4 musketeers and 6 rowers, every one provided with a pike and sidearms, together with the launch (*praeutien, sloep*) of the *Zeehaen*, and one of their second mates and 6 musketeers, to an inlet (*innijch*), which was situated fully a long mile (*i.e.*, over 4 miles) north-west of us, in order to see what useful things—such as fresh water, refreshments, timber, and other things—might be obtainable there. About 3 hours before evening our boats returned, bringing various samples of vegetables, which they had seen growing in abundance, some not unlike certain herbs which grow at the *Cabo de Bona Esperance* (*Cape of Good Hope*), and are fit for use as pot herbs. Others were long and saltish, which have no ill-likeness to sea-parsley. The Pilot-Major and the second-mate of the *Zeehaen* reported what follows, namely :—

That they had rowed above a mile (4 miles) to the said point, where they had found high but level land with herbs (not planted, but springing from God and nature), fruitful timber in plenty, and a running watering place, and many open valleys ; which water was good indeed, but very troublesome to draw, and running so slowly that it could only be taken out with a bowl.

That they had heard some sound of people ; also a playing nearly like a trumpet or small gom [gong], which was not far from them, but they had not got to see anyone.

That they had seen two trees about 2 to 2½ fathoms thick, 60 to 65 feet high below the branches, which trees had been hacked into with flints, and the bark peeled off in the form of steps (in order to climb up thereby and take birds' nests), each being full 5 feet from the other. So that they presumed that there were very tall men here, or that they must know how to climb the said trees by some device. In one tree these cut steps seemed so fresh and green as if not four days had passed since they had been hewn.

That they had observed in the earth footprints or scratchings of some beasts, not ill-resembling the claws of a tiger. They also brought on board some dung of four-footed beasts (as they presumed and could observe), besides a little gum, fine in appearance, which drops out of the trees, and has a resemblance to gumlac (*gomma lacca*). That about the east point of this bay, having sounded at high-water, they had found 13 to 14 feet ; the ebb and flood there about 3 feet.

That in the entrance of the said point they had seen a multitude of gulls, wild ducks, and geese, but none landward ; though they had indeed heard the noise of them ; and had observed no fish, but divers mussels sticking in sundry places on bushes,

That the country is generally occupied with trees, which stand so thinly scattered that you may pass through everywhere and see to a far distance ; so that you could always get sight of people or wild beasts in the country, as it is unencumbered by thick wood or underwood; which should give great facility for the exploring of the country.

That in various places in the interior they had seen many trees which had been deeply burnt into above their roots. The earth was here and there beaten down and burnt as hard as stones by the lighting of fires on it.

A little before our boats (which were coming on board) got within sight, we saw at times a thick smoke rising on the land, which lay about W. by N. from us. We therefore presumed that our people were doing it for a signal, because they were delayed so long in returning ; for they had their orders to come back to us with speed, partly in order to inform us of their discoveries, or otherwise, if they saw there was nothing useful there, that they might go to examine other places, so that no time should be spent uselessly. Our people having come on board we asked them whether they had been thereabouts and had lighted fires, whereupon they replied that they had not, but that at divers times and places in the woods they also had seen smokes ; so that without doubt there must be men in this place, and these of an uncommon stature.

To-day, had much variable wind from the eastward, but the most of the day a stiff steady gale from the S.E.

3rd December.—To-day we went with the Merchant GILSEMANS and our boats, as yesterday, with musketeers, the rowers being provided with pikes and side arms, to the S.E. side of this bay. Where we found water, but the land so low that the fresh water was made brackish and salt through the breaking of the sea, and the ground was too rocky to sink wells. Therefore returned on board, summoned the council of our two ships, with whom we resolved and found to be good, as is shown by the resolution of this date, where it is to be seen at length and is set forth ; whereto for brevity's sake we here refer. Afternoon, we went with the said boats, together with the Pilot-Major FRANCOYS JACOBSZ, the Skipper GERRIT JANSZ, ISACK GILSEMANS, Merchant of the *Zeehaen*, the Junior Merchant ABRAHAM COOMANS, and our Chief Carpenter PIETER JACOBSZ, to the S.E. corner of this bay, having with us a pole with the Company's mark cut therein, and the Prince's flag, in order to set the same up there, so that it may be evident to posterity that we have been here and taken the said land for a possession and property. Having rowed with our boats about half way, it began to blow hard and the sea to rise so high that the launch of the *Zeehaen*, in

which were the Pilot-Major and Sr. GILSEMANS, was obliged to return on board. We went on with our long-boat (*chaloup*), coming close under the shore into a little bay which lay W.S.W. from the ships. The surf broke at such a rate that the land could not be approached without danger of the boat being dashed in pieces. We ordered the said carpenter to swim ashore by himself with the pole and Prince's flag, and remained with the long-boat lying to the wind. We made him set up the said pole with the flag at the top in the earth before a decaying tree, the lowest one of a group of four noticeable high trees standing in the form of a crescent about the middle of this bay. This tree is burnt just above the foot, and is indeed the tallest of the other three,* though it appears to be not so high, since it stands on the declivity of the cluster. It has at the top above its crown two high dry branches sticking out, so uniformly set about with dry twigs and branchlets that it looks like the great horns of a stag. Moreover, on the undermost side there stands a very green and round well-crowned branch, the shoots of which, by their even proportion, made the said tree very elegant and like the top of a larding pin. After the head carpenter had accomplished the matter above rehearsed, in view of me, ABEL JANSZ TASMAN, the Skipper GERRIT JANSZ, and the Junior Merchant ABRAHAM COOMANS, we rowed the boat as near to the shore as we dared venture, and the said carpenter swam back again to the long-boat through the surf; when, after accomplishing this matter, we rowed back again on board, leaving the above-mentioned as a memorial to posterity and to the inhabitants of this country, who did not show themselves, although we suspected that some of them were not far from there, and kept watchful eyes on our proceedings.

We did not look for herbs, for on account of the roughness of the sea no one could reach the shore save by swimming, so that it was impossible to bring anything to the long-boat. All day the wind was mostly northerly. In the evening took observation of the sun, and found 3° N.E. variation. With sunset got a strong north wind, which rapidly increased to so violent a storm from the N.N.W. that we were constrained to strike both yards and to let go our bower anchor.

4th December.—With the dawning of day the storm abated. The weather moderate, and the wind being off shore W. by N. Hove in the bower anchor again. The said anchor being hove up and got above water, saw that both flukes were so far gone that we got home nothing but the bare shaft. Weighed the other anchor also, and got under sail, in

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* *Sic* in original.

order to sail to the north between the most northerly islands, and to seek a more convenient watering-place. We have lain at anchor here in S. lat. 43°, long. 167½°, Before noon the wind westerly. At noon found lat. 42° 40′, long. 168°. Course held N.E., and sailed 8 (32) miles. Afternoon, the wind N.W. The whole day very variable winds. In the evening again had W.N.W. with strong wind, W. by N., and W.N.W. Tacked about to the northward. In the evening saw a round mountain N.N.W. of us about 8 (32) miles. Course close hauled by the wind northwards. In sailing out of this bay, and also the whole day through, saw away along the coast much smoke rising from fires. We should here describe the trend of the coast and of the neighbouring islands, but excuse the same in order to be brief, referring to the small chart that has been made of it, and is subjoined herewith.

[Here is probably meant the chart of which mention is made in the conclusion of this Journal for 1st December.—JACOB SWART.]

5th December.—In the morning the wind N.W. by W. Still made our course as before. The high round mountain which we had seen the day before bore due W. of us 6 (24) miles, from whence the land falls off to the N.W., so that we could no longer hold the land on board, because the wind was almost ahead. Wherefore we summoned the Council and second mates, who proposed, and it was therewith resolved—the officers of the *Zeehaen* having been spoken—to set our course due east, according to the resolution of the 11th ulto., and to run on this course until we reach the longitude of 195°, or that of the *Salomonis Islands,* as may be more fully seen by the resolution of this date. Noon, reckoned lat. 41° 34′, long. 169°. Course held N.E. by N., and sailed 20 (80) miles. Set our course due east, in order to make further discoveries, and also in order not to fall into the variable winds between the trades and counter-trades. The wind N.W., fresh gale. At night the wind W., strong fresh gale and good clear weather.

WILLIAM GRAHAME, JUN.,
GOVERNMENT PRINTER, TASMANIA.

LIST OF THE DESCRIBED PLANTS OF PERMO-CARBONIFEROUS AND MESOZOIC AGE IN TASMANIAN ROCKS, SHOWING DISTRIBUTION IN THE VARIOUS FORMATIONS.

COMPILED BY R. M. JOHNSTON, F.L.S.

FOSSIL PLANTS.		MESOZOIC.			PERMO-CARBONIFEROUS (UPPER PALÆOZOIC).						
		Upper Coal Measures.	Ida Bay Coal Measures.	Lower Sandstones (Lower Mesozoic).	Southport Beds.	Mount Cygnet Coal Measures.	Adventure Bay Coal Measures.	Upper Marine Beds.	Lower Coal Measures.	Tasmanite Beds.	Lower Marine Beds.
FILICES.											
Alethopteris Australis	*Morris*			—							
,, serratifolia	*R. M. Johnston*			—							
Cardiopteris Tasmanica	,,			—							
Cyclopteris? Australis*	,,			—							
Danæa Morrisiana	,,			—							
Gangamopteris augustifolia	*McCoy*								—		
,, cyclopteroides, var. attenuata ..	*Feistm.*								—		
,, ,, ,, sub-auriculata	,,								—		
,, obliqua	*McCoy*						—		—		
,, spathulata	,,						—		—		
Gleichenia dubia	*Feistm.*	—							—		
Glossopteris ampla	,,						—		—		
,, Browniana	,,								—		
,, communis	,,								—		
,, elongata	,,								—		
,, reticulum	,,								—		
,, moribunda	*R. M. Johnston*	—							—		
,, ovata	,,								—		
,, spathulato-cordata	*Feistm.*								—		
Macrotæniopteris wianamattæ	,,	—									
Neuropteris antipoda	*R. M. Johnston*	—									
,, Tasmaniensis	,,	—									
Odontopteris crispata	,,	—									
Pecopteris Buftoni	,,	—									
,, caudata	,,	—									
,, Lunensis	,,	—			—			—			
,, odontopteroides	*Morris*	—									
Rhacophyllum coriaceum	*R. M. Johnston*	—									
Sagenopteris Tasmanica	*Feistm.*	—									
Sphenopteris Morrisiana	*R. M. Johnston*	—									
Sphenopteris flexuosa	*McCoy*	—									
,, *germana*	,,	—									
,, *hastata*	,,	—									
,, *lobifolia*	*Morris*	—									
,, *plumosa*	*McCoy*	—									
Sphenopteris alata	*Brongt*	—									
,, elongata	*Carruthers*	—									
,, Tasmanica	*R. M. Johnston*	—									
Strzeleckia gangamopteriodes	,,	—									
,, tenuifolia	,,	—									
Tæniopteris Morrisiana	,,	—									
,, Tasmanica	,,	—									
Thinnfeldia Buftoni	,,	—									
,, Feishmantelli	,,	—									
,, obtusifolia	,,	—									
,, media	*T. Woods*	—									
,, polymorpha	*R. M. Johnston*	—									
,, superba	,,	—									
,, trilobita	,,	—									
Trichomanidas ettingshanseni	,,	—									
,, spinifolium	*T. Woods*	—									
EQUISITACEÆ.											
Annularia Australis	*Morris*	—									
Phyllotheca Australis	*Brongt*										
,, Hookeri	*McCoy*										
,, ramosa	,,										
LYCOPUDIACEÆ.											
Lepidostrobus Muelleri	*R. M. Johnston*										
Knorria sp.†	,,										
Tasmanites punctatus	*Newton*									—	
CYCADACEÆ.											
Podozamites distans?	*Presé*	—									
Pterophyllum dubia	*R. M. Johnston*	—									
,, Risdonensis	,,	—									
,, Strahani	,,	—									
Sphenozamites Feistmantelii	,,	—									
Ptilophyllum oligoneurum	*T. Woods*	—									
CONIFERÆ.											
Baiera tenuifolia	*R. M. Johnston*	—									
Ginkgophyllum Australis	,,	—									
Noggerathiopsis Hislopi	*Feistm.*								—		
,, media	,,								—		
,, prisca?	,,								—		
Salisburia Hobartensis	*R. M. Johnston*	—									
Zeugophyllites (Poa-Cordaites) elongatus	*Morris*	—			—						
AFFINITIES UNCERTAIN.											
Carpolithes Tasmanicus	*R. M. Johnston*								—		
Cryptophyllites Tasmanica	,,						—				
Endogenophyllites Wellingtonensis	*McCoy*										
Samaropsis sp.									—		
Squamæ gymnospe marum	*Feist*										
Vertebraria Australis	*McCoy*				—		—				

* Possibly a Salisburia. † Locality and horizon unknown. NOTE.—*Sagenopteris salisburioides* to add to list.

FURTHER CONTRIBUTIONS TO THE HISTORY OF THE FOSSIL FLORA OF TASMANIA.

Part II.

By R. M. Johnston, F.L.S.

(*Read May 20th*, 1895.)

The second of this series of contributions to the history of our Fossil Flora refers largely to collections of plants made by the Rev. J. Bufton, F.L.S., from Upper Mesozoic coal measures shales in the neighbourhood of Dunally, which collection this accomplished naturalist kindly placed at my disposal. It will be seen from the notes, descriptions, and figures which follow that I have been enabled by these collections to add to the list several interesting plant forms new at least to our Tasmanian Fossil Flora.

With one or two of the forms, new to science, it has afforded me great pleasure to associate the name of the discoverer.

I am indebted also to my friend, A. Montgomery, M.A., F.G.S., our Government Geologist, for more perfect specimens of three species of undescribed, or imperfectly described, fossil plants occurring in the coal measures of Fingal, Seymour, and York Plains.

By the more perfect examples, thus obtained, I have been enabled to add a new genus to our list (*Strzeleckia*) of Mesozoic plants, and also three new species. I had long been on the outlook for perfect examples of these forms, which I recognised many years ago; but the specimens in my possession hitherto were too imperfect to determine their specific characters satisfactorily.

I have also added to the list one or two interesting forms obtained by myself some years ago from shales of Upper Mesozoic Age at Lord's Hill, New Town, and elsewhere.

I have in a separate table prepared a complete classified list of all the species of fossil plants known to me of Permo-carboniferous and Mesozoic Age which have been described to date, including those new forms described in this contribution. This table (embracing 75 species) is also arranged to show what I now conceive to be the probable order of succession of the principal groups and formations; and against each are recorded their respective floras for the benefit of the stratagraphist and the mining expert.

Strzeleckia, nov. gen.

Frond simple; form variable; now equilateral or inequilateral; now oblique, falcate, or symmetrical; now elongate-

lanceolate, elongate-spathulate, or linear-lanceolate, and in rudimentary forms, frequently wide, inequilateral, oblique, and subtrigonal. In all forms there is a gradual tapering towards the base to a linear strap-shaped petiole, which is more or less amplexicaul; no mid-rib; nerves numerous, distinct, ascending from base, and from the crowded mid-rib-like central series, at a very acute angle to the margin, but *never anastomosing*. The central series become less crowded towards middle, and, towards apex, the central series spread out and diverge symmetrically as in the lateral series.

This genus—evidently a tufted form—comes near to *gangamopteris* in all characteristics, from which it is distinguished by the total absence of nerve anastomoses.

So far as known this genus is confined to the Upper Mesozoic coal measures, and occurs commonly in the upper coal measure shales at Mount Nicholas and Spring Bay.

Strzeleckia gangamopteroides. (Nov. sp. Figs. 5-7.)

Frond simple, variable, possessing all the characteristics of the genus, save that it is never linear, as in the following species.

Mature form generally broadest above the middle; apex obtusely pointed. Greatest length from 4 to $4\frac{1}{2}$ inches; greatest breadth, about three-quarters of an inch. Lateral or oblique rudimentary forms; greatest length, $2\frac{1}{4}$ inches; greatest breadth (middle), $\frac{7}{8}$ inch

Locality, Mount Nicholas coal measures, Tasmania (common).

In Plate 26, Fig. 2, "Geology of Tasmania," I referred a doubtful form to *Pecopteris caudata* (Mihi), but the specimens thus referred to did not show the neuration clearly. I am now confident that it should be referred to *S. gangamopteroides.*

Strzeleckia tenuifolia. (Nov. sp. Fig. 8.)

Form simple, almost symmetrical, elongate, linear-lanceolate; apex obtusely accuminate, very gently narrowing to a long attenuate, and slightly oblique petiole. Nerves distinct, not so crowded as in the preceding species (*S. gangamopteroides*), ascending acutely to margin.

Greatest length $4\frac{1}{4}$ to $4\frac{1}{2}$ inches, greatest breadth $\frac{1}{8}$ inch.

Locality, Mount Nicholas coal measures, Tasmania (common).

Sphenopteris Morrisiana, (Nov. sp. Figs. 14, 15.)

Frond large (imperfect), bi-pinnate, deltoid, or lanceolate-deltoid, probably 2 to 3 feet long in completed state, and about 8 or 9 inches across towards base; *stipe*, rounded and

firm; *pinnæ*, somewhat distantly placed; spaces varying from $1\frac{1}{4}$ inches in the upper portion to $1\frac{1}{2}$ and even 2 inches in the lower, generally ascending in a gentle curve from rhachis at an angle of 45°-50°. *Pinnæ* broadly linear-lanceolate, opposite in the upper portion of frond and alternate in the lower. *Pinnules* numerous, somewhat distant, sub-opposite, variously lobed, linear-lanceolate and generally wavy or falciform. The series on upper side of rhachis are somewhat erect, and are directed towards apex of frond, overlapping about $\frac{3}{4}$ of the lower series, which curve forwards towards extremities at a more acute angle. Each pinnule gradually broadens towards base, where it is suddenly rounded and constricted, and becomes almost petiolate. The basal-lobe of upper side is bent or inflated into an auricle, whose lower margin runs almost parallel for some distance with the rhachis. The rounded basal-lobe of lower side is cut away more sharply. Each side of pinnule is incised to about half of its breadth by a number of ovately-rounded lobes, usually with a dentate or obscurely trilobate terminal. The number of pairs of lobes diminishes as the pinnæ approach apex of frond, where they are finally reduced to four, and even three pairs of lobes, with the usual dentate or obscurely trilobate terminal. The nerves vary with the lobes in the number and in complexity of furcation. Each pinnule is characterised by a firm wavy mid-rib, which only evanesces in the terminal lobe; from the mid-rib a single nerve ascends into each lobe, which rapidly spreads furcately. The number of nervures which reach the margin varies not only with the position of the pinnule on the frond, but also with the position of the lobe on the pinnule; in the pinnules towards base of frond the basal-lobe usually has 7 or 8 nervures, which in branching reach the margin. These gradually diminish in number towards terminal of pinnule, where usually only three or four nervures reach the margin, A similar diminution in the number of nervures reaching margin occurs in even the basal lobe of pinnules accordingly as we ascend the several pinnæ to the apex of frond.

I have described this handsome fern very minutely, especially as regards the number of lobes and nervures, as a number of species of this genus in Australia and Tasmania have already been described and recognised as distinct species upon small fragments of detached pinnules only, whose specific separation from each other is only based upon such small differences as occur together in different parts of the frond of the more perfect specimen now described by me as *S. Morrisiana*.

The first species so described by the late Professor John Morris (*S. lobata*) may well be included under the specific name covering a more complete specific description as now

given; and possibly also the following species:—*S. flexuosa*, *S. hastata*, *S. germana*, *S. plumosa*, originally described by Professor Sir Fred. M'Coy from isolated pinnule fragments, may yet be referred to the more complete type. I have thought it best, in order to avoid confusion with the older specific names, to associate the form described and figured by me with the name of the author of the first described fragment (S. lobata), viz., *Sphenopteris Morrisiana*, mihi.

Upper Mesozoic coal measure shales, Seymour, Tasmania.

Sphenopteris tasmanica. (Nov. sp. Figs. 10-13.)

Frond bi-pinnate, lanceolate, probably when complete 12-15 inches in length. *Stipe* generally erect, round, slender, undulating. *Pinnæ* opposite, numerous, closely placed, symmetrical, linear-lanceolate, falciform, tapering gently and curving upwards. There are about 15 pairs of pinnules on the larger pinnæ towards the middle of frond. *Pinnules* somewhat ovato-deltoid, opposite, decurrent, unsymmetrical, the upper base being extended into a small auricle, which slightly overlaps the lower and straighter cut-away base of succeeding pinnule; margins of pinnule simple; the uniformly auricled base of pinnules gives a winged appearance to the very slender thread-like stalks of pinnæ. *Nerves*, a single somewhat strongly marked flexuous nerve ascends from rhachis into each pinnule, branching dichotomously; generally two pairs of furcations reach margin on either side of pinnule, and one pair reaching the apex; but these branchings vary, both with the position of pinnule on pinnæ and on froud, the lower side of pinnule often having one or two nerves less than upon upper side. All these nervures are firm and well-defined.

Greatest breadth of frond, 3-3$\frac{1}{4}$ inches.
Greatest breadth of pinnæ, $\frac{1}{4}$-$\frac{5}{8}$ inch.
Greatest length of pinnule, $\frac{3}{16}$-$\frac{1}{4}$ inch.

This interesting fern was discovered by the writer several years ago in the upper coal measure shales (Mesozoic) at Lord's Hill, New Town, near Hobart. It is very distinct from any other species of this genus, and is extremely rare, as I have found no trace of it elsewhere throughout similar formations in Tasmania.

Pecopteris Buftoni. (Nov. sp. Fig. 3.)

Frond unknown. *Pinna* imparipinnate, lanceolate-ovate; pinnules or lobes simple, sub-ovate, with round or bluntish apices, curving gently upwards; the narrow rounded sinus between each lobe extends nearly to rhachis, forming thereby a continuous narrow wing to which each lobe or pinnule is attached by its whole breadth; margins thickened as if caused by the curvature of a continuous marginal sori; mid-

rib conspicuous; secondary veins concealed in a somewhat coriaceous integument.

Although the fragment is very imperfect, the above characters will serve to identify it, as it is very markedly distinct from any other allied forms described as occurring in Australia or Tasmania.

Collected by the Rev. J. Bufton from the Mesozoic shales of Dunally.

PECOPTERIS CAUDATA. (R. M. Johnston. Fig. 4.)

Fig. 4 is now referred by me to the above species. At first, owing to the more delicate structure and apparently finer neuration, I was inclined to separate it from the above species under the name *Pecopteris tonsorius*, but as this small difference may be due to habitat or to the medium in which it is preserved, I have thought it better to refer it for the present to my original species (P. caudata). The figure given is presented in natural size.

Locality.—Altered shales near East Bay Neck, Tasman Peninsula, Tasmania.

Collected by the Rev. J. Bufton, Dunally.

Thinnfeldia Buftoni. (Nov. sp. Fig. 18.)

Frond pinnatifid (? bi-pinnate); pinnæ nearly opposite, lanceolate, stromboido-lanceolate, falcate, accuminate; margin simple; the lower pinnæ probably shorter, giving the frond a broadly lanciform appearance; the upper side of base more or less roundly constricted, nearly auricled; the lower side of base also more or less constricted, and almost decurrent, giving the rhachis a faintly winged appearance; texture very delicate; stalk, though somewhat broad, appears to be thin, flat, weak, and membranaceous, with a few fine longitudinal striæ. Nerves, comparatively few, arising freely from base, and ascending dichotomously, and laxly, at a high angle (nearly parallel) to margin, the central nerve reaching apex, being only a little more prominent than the free lateral series. All the nerves are extremely fine, and are almost completely immersed in the delicate *pachypteris*-like tissue.

Length of larger pinnæ, about $1\frac{1}{2}$ inches; greatest breadth, about $\frac{1}{4}$ inch.

In form and general characteristics it comes very close to *Thinnfeldia indica*, Fstm., of the Indian Rajmahal Group. It differs from the latter, however, in having finer and more delicate nerves, and a more delicate texture. The nerves differ also in the manner in which the greater number spring freely from base instead of acutely arising mainly from central primary. The more or less parallel arrangement of the nerves also distinguishes the species from its allied Indian congener.

This interesting fern occurs in the Upper Mesozoic shales, Dunally, where it was collected by the Rev. J. Bufton, F.L.S. I have now great pleasure in associating its name with its accomplished discoverer.

Thinnfeldia polymorpha. (Nov. sp. Fig. 16.)

Frond bi-pinnate, dichotomous; pinnæ never dichotomous, distant, opposite, sub-opposite or alternate, extremely variable in form; generally linear-lanceolate, linear-ovate, and occasionally simply ovate; bases contracted and somewhat auricled; margins variously and irregularly sinuous, lobate, or simple; in some the lobes are confined to the base with narrow caudate extremities; in others the lobes, shallow and more or less irregular, are continuous throughout, and in a few they are simple or rudimentary. Stalk thick, and strongly grooved with an obscure nerve-like wing on either margin; each lobe has an independent set of fine branching nerves similar in character and arrangement to those of *Thinnfeldia obtusifolia*, Mihi., to which this strikingly variable form has a close affinity in many respects. Were it not that nearly every specimen of this polymorphous fern is similarly variable in the shales of Dunally, and the uniformly dichotomous and regularly lobed form of *T. obtusifolis* is rarely to be found there, I should hesitate in separating it from some extreme forms of the latter, but in any case the distinctive name now applied will serve a useful purpose for reference independently of doubt as to its true organic alliance. Length of the larger pinnæ, about $2\frac{1}{2}$ inches; greatest breadth towards base, $\frac{1}{4}$-$\frac{5}{16}$ inch.

Very common in Mesozoic shales near Dunally. Collected by the Rev. J. Bufton, F.L.S.

In my work on "The Geology of Tasmania" (Pt. xxvi,, figs. 2, 6, and 20) I refer certain doubtful forms to *Pecopteris caudata*, Mihi. I am now inclined to refer them to the above species, viz., *T. polymorpha*.

Genus Cardiopteris. *Schimper.*

The following definition of the above genus is taken from M. B. Renault, Cours de Botanique Fossils (Fougeres, pp. 201-202):—

"Frond pinée, rachis strié longitudinalement, cylindrique, pinnilles insérées perpendiculairment à la face supériurede ce dernier, rapprochées, imbriquès, ovales, cordiformes, plus pitetes à la partie infériure des pennes où elles prennent une forme circulaire; toutes ont une forme smyétrique, et sont inséprées par le milieu de leur base, coriaces, à bords infèctus, nervures ègales naissant sur le rachis, plusieurs fois dichotomes, et sèpanouissant en éventail."

Terrain Houiller. France.

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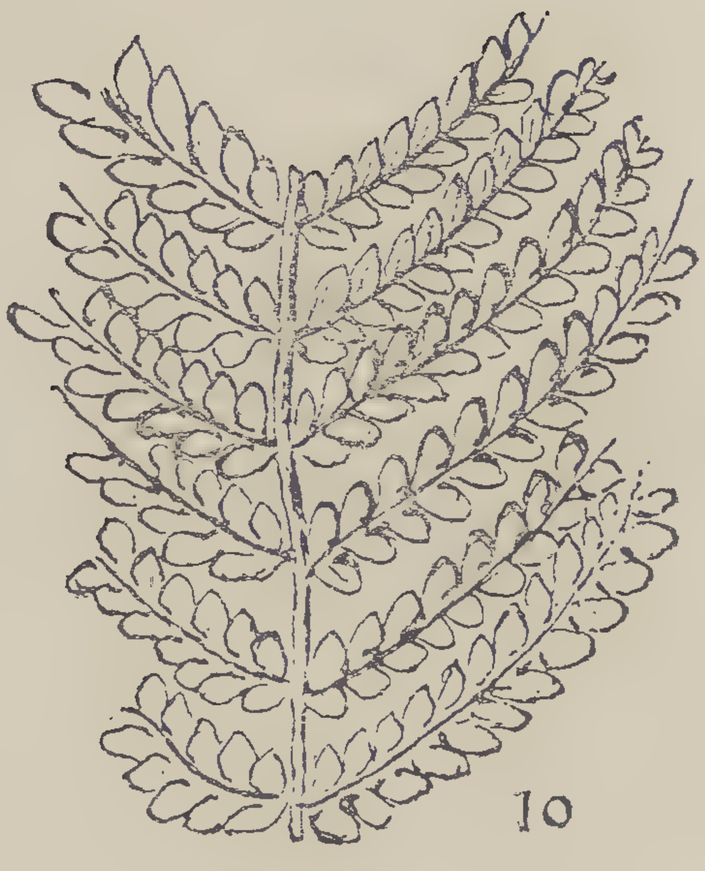

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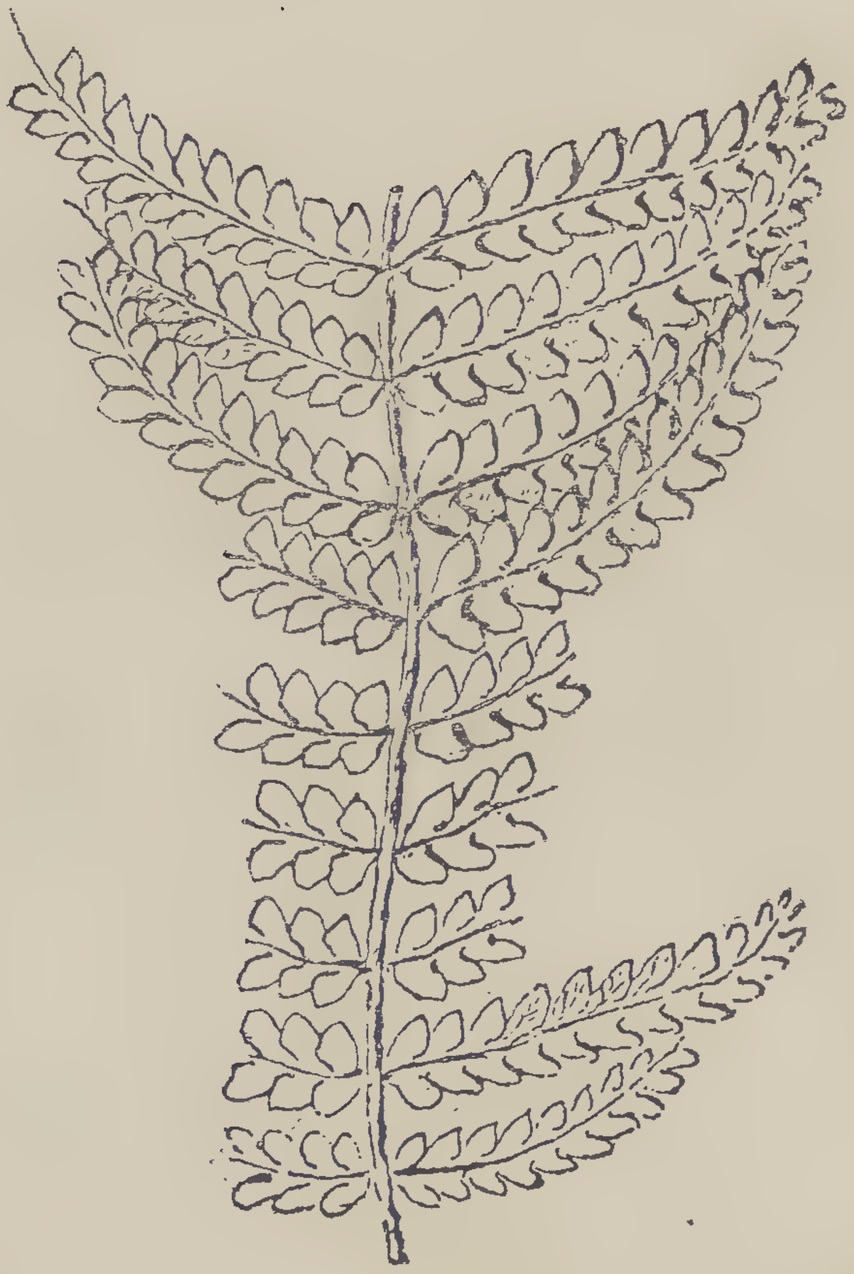

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Cardiopteris tasmanicus. (Nov. sp. Fig. 9.)

Frond reniform-cordate, deeply auricled. Nerves numerous, distinct, although somewhat immersed in a coriaceous membrane, and radiating from base attachment to margin regularly, arcuately, and dichotomously.

With the exception that it is more symmetrically rotund and more deeply auricled, it comes close to *Cardiopteris frondosa* (Goe p.), Schimper.

Greatest length, $\frac{14}{16}$ inch. Greatest breadth, $\frac{14}{16}$ inch.

Locality.—Altered Upper Mesozoic coal measure shales, near East Bay Neck, Tasman Peninsula, Tasmania.

Collected by the Rev. J. Bufton, Dunally.

Other Species of Plants Occurring in the Dunally Shales.

The greater part of the shales forwarded to me by the Rev. J. Bufton are much broken and friable, and the impressions are either obscure or very fragmentary. From a careful examination of these, however, I have, in addition to the forms already described, considerable confidence in referring a number of them to the following genera and species:—

Macrotæniopteris wianamattæ? Fstm.
Gleichenia dubia. Fstm. (Fig, 17.)
Trichomanides spinifolium. T. Woods.
Neuropteris tasmaniensis? R. M. Johnston. (Fig. 1.)
Ptilophyllum oligoneurum. T. Woods.
Pterophyllum. Sp.

Reference to Figures of Plants Described in this Paper.

Fig. 1. Probably a variety of the variable *Neuropteris tasmaniensis.* (R. M. Johnston.)
„ 2. *Thinnfeldia Feistenantelli.* (R. M. Johnston.)
„ 3. *Pecopteris Buftoni.* (Nov. sp.)
„ 4. *Pecopteris caudata.* (R. M. Johnston.)
„ 5, 6, 7. *Strzeleckia gangamopteroides.* (Nov. sp.)
„ 8. *Strzeleckia tenuifolia.* (Nov. sp.)
„ 9. *Cardiopteris tasmanica.* (Nov. sp.)
„ 10, 12. *Sphenopteris tasmanica.* (Nov. sp.)
„ 11, 13. Enlarged pinnules of 10-12.
„ 14. *Sphenopteris Morrisiana.* (Nov. sp.)
„ 15. Enlarged pinnules of 14.
„ 16. *Thinnfeldia polymorpha.* (Nov. sp.)
„ 18. *Thinnfeldia Buftoni.* (Nov. sp.)
„ 17. *Gleichenia dubia.* (Fstm.)

BOTANY OF THE HARTZ AND ADAMSON RANGES.

By L. Rodway.

(Read May 20th, 1895.)

The south-west of Tasmania has many attractions to the botanist, the principal of which are, firstly, that the district has not been examined botanically beyond a few flying visits to a few places ; secondly, that there are many plants growing in this district that are seldom or never found elsewhere.

It is only my intention to refer to plants of unusual interest, whether of distribution or other detail, and in doing so I shall deal with them in the order they occur in Bentham's Flora Australiensis.

Eriostemon oldfieldii, F. v. M., occurs on a northern spur of Adamson's Peak. It has hitherto been only recorded from Mount La Perouse and Cradle Mountain, where it was obtained in young fruit only. I am now in a position to describe the flower. Sepals about $\frac{1}{3}$ line long, broad ; petals white and pink, narrow, oblong, about $2\frac{1}{2}$ to 3 lines long ; both sepals and petals vary in number from 5 to 7, but are generally 6 ; stamens usually 12, filaments long, slender, glabrous ; style slender ; cocci verrucose. Flowering about December.

Eucryphia billardieri, Spack, abounds throughout the district, ascending to nearly 4,000ft. At high altitudes the habit is a small shrub, and in places even procumbent and creeping over rocks, the leaves being reduced to $\frac{1}{2}$in. Hooker, in the Flora Tasmaniæ, describes the smaller leaved as a distinct species, *E. milligani*. In this district the transition is unbroken.

Anodopetalum biglandulosum, Cunn., is very abundant.

Drosera arcturi, Hook, is found everywhere at a high altitude, and *D. binata*, Lab., is common at the foot of Adamson's.

Leptospermum lanigerum, Sm., departs greatly from the type on the plateau of Adamson's, being nearly glabrous, with large leaves and flowers. A nearly allied form occurs in N.W. Tasmania and probably elsewhere.

Eucalyptus vernicosa, H., occurs on the Hartz, and here appears to constantly bear but one flower in an axil; specimens from other localities are usually 3-flowered.

Geum renifolium, F. v. M., grows in the crevices of the rocks on the Calf at the back of Adamson's, as well as on the main ridge.

Diplaspis hydrocotyle, H., in swampy land on the plateau on the eastern side of the summit of Adamson's.

Actinotus suffocata, H., is widely distributed throughout the range, but I did not meet with the coarser *A. bellidioides*, H., which is the much commoner form towards the West Coast.

Actinotus moorei, F. v. M. et R., grows in quantity in a button-grass swamp on the track to the Hartz at about 1,700ft.

Aciphylla procumbens, F. v. M., hitherto only recorded from Mount La Perouse, grows both on the Hartz and Adamson's. This plant, though agreeing with *Aciphylla* in general habit, differs in the structure of the fruit in this feature approaching *Ligusticum*. Von Müeller proposed to suppress the genus and include it in *Gingidium*.

Comprosma moorei, F. v. M. et R., occurs on Adamson's.

Abrotanella scapigera, F. v. M., grows on the northern spur of Adamson's, near the Calf, but *A. forsterioides*, H., appears to be quite absent, its place being taken by *Donatia novæ-zelandieæ*.

Helichrysum milligani, H., is very common on Adamson's, and the more common *H. pumilum* also occurs but sparingly.

Pterygopappus lawrencei, H., I observed in one small patch at the back of the Calf.

Senecio papillosus, F. v. M. Also only recorded from Mount La Perouse, is very common on Adamson's, but it did not appear to extend to the Hartz. The more scarce *S. primulifolius*, F. v. M., which occurs on La Perouse, I looked for in vain.

Senecio pectinatus, D. C., in divers forms occurs throughout the district. The type plant, var. *ochroleuca*, and var. *pleiocephalus*, also known as *S. leptocarpus*, D.C., grow all together with many intermediate forms.

Donatia novæzelandiæ, H., whose dense green cushions are exactly like *Abrotanella forsterioides*, H., so common on Mount Wellington, is very abundant throughout these ranges. This plant has a much wider Tasmanian distribution than has hitherto been recorded. It extends from Cradle Mountain to La Perouse, and from the Hartz to Mount Reid.

Archeria serpillifolia, H., appears at the back of the Calf.

Trochocarpa disticha, Spreng., *T. gunnii*., F. v. M., and *Prionotes cerinthoides*, are very abundant.

Richea pandanifolia, H., is also very abundant, and *R. milligani*, F. v. M., occurs in quantity in the dip between Hartz and Adamson's.

Dracophyllum milligani, H., is tolerably common at the back of the Calf. By some mistake Bentham records this as attaining the height of *Richea pandanifolia*, and the Rev. Spicer, in his handbook, refers to the plant being erect, and 3 to 40 feet high. The habit of the plant is creeping, subterranean, sending up flowering branches that reach a height of 1 to 4 feet.

Cenarrhenes nitida, Lab., and *Agastachys odorata*, R. Br., are very common.

Arthrotaxis selaginoides, Don., occurs sparingly on the Hartz and the northern spur of Adamson's; but in the latter locality there are very many old dead stems, the remains of a forest that was destroyed many a long year ago. The oldest inhabitant says it was due to an extraordinarily hard winter.

Microcachrys tetragona, H., *Podocarpus alpina*, R. Br., and *Phyllocladus rhomboidalis*, Rich., are the only other conifers observed.

Milligania densiflora, H., is very common, and nearly replaces the more widely distributed *Astelia alpina*, R. Br.

Milligania stylosa, F. v. M., occurs on the eastern side of Adamson's. The perianth segments are quite 4 to 5 lines long. In the original description they are recorded as about 2 lines.

Juncus capillaceus, Hook, forms dense patches.

Centrolepis monogyna, Hook, also is most abundant, at least on Adamson's.

Gaimardia fitzgeraldi, F. v. M. et R., which has hitherto only been found sparingly on Mount Geikie by W. Fitzgerald,

F.R.G.S., I found in great abundance in the dip between Hartz and Adamson's, and on the plateau to the east near the summit of Adamson's.

Ehrharta (Diplax) Tasmaniæ, F. v. M., is very common from the foot to the summit of Adamson's. I also found an *Ehrharta*, probably new to science, on the northern spur. I hope to shortly describe it.

Lomaria vulcanica, Blume, occurs on the Hartz.

Hymenophyllum malingii also occurs on the Hartz on the bark of *Arthrotoxis selaginoides*.

Cyathea cunninghami occurs between Esperance and Adamson's. This interesting fern has hitherto been recorded in Tasmania from Circular Head, near Scottsdale, Port Cygnet, Long Bay, Geeveston, and Oyster Cove. In Spicer's Handbook *Alsophila cooperi* is recorded from Adamson's. I am very disposed to think it an error; probably a barren frond of *Cyathea* is responsible for it.

Pleurophascum grandiglobum, *Splachnum (Tetraplodon) tasmanicum* also grow on Adamson's.

Forstera bellidifolia, Hook, grows throughout both ranges. Its place in this list should have been next *Donatia*. This interesting little plant has hitherto been found only on the western mountains of Tasmania.

NOTE ON TIMBER FOUND BENEATH ALLUVIAL DRIFT AT SWANSEA.

By Col. W. V. Legge, R.A., F.Z.S., M.B.O.U.

(*Read August 10th*, 1895.)

On the pleasant drive from Bicheno to Swansea the traveller, after crossing over the spurs of the range called "Lyne's Sugar Loaf" by the so-called "cut," comes suddenly in view of the large level tract of country lying south of the hills he is descending, and stretching from the hamlet of Cranbrook inwards towards the foot of the ranges which bound the St. Paul's Valley on the east. This tract is mainly formed by the coast range, which fringes the shore from St. Patrick's Head to Bicheno, suddenly swerving inland at the latter place, and joining the above-mentioned highlands east of the St. Paul's which lie at some distance from the East Coast. At the latitude of Swansea the ranges approach the coast again, and then follow the shore southwards. The level tract of country hemmed in by these features is alluvial, and forms what may be generally styled the basin of the Swan River, and its smaller companion streams, the "Cygnet" and the "Wye." Unfortunately the topography of this island is so poorly delineated on existing maps that the mountain features I have touched upon scarcely appear upon them, and unless one visits the district one would have no idea that there is so large a tract of level country on the Swan River.

The surface of this "basin" is mostly level, with here and there gentle rises of about 100 feet in altitude. The soil is chiefly dark chocolate, being apparently the result of denudation and drift from the extensive valleys on the highlands at the back. On the estate of Cambria, which lies mainly at the foot of the hill, locally called the "Lookout," the soil is rich and of great depth; and on that part of it lying between the main road and the shores of Oyster Bay there is a lagoon of considerable extent, which seems in former times to have had egress to the Meredith River by a watercourse now extinct, but visible in the form of an ordinary sinuous depression in the paddocks. Following the course of this depression a deep dyke has recently been cut by Mr. Meredith to drain the lagoon. In the shallowest part of the old watercourse this ditch attains a maximum depth of about 12 feet, and it was at the bottom of it that the men employed in the work came upon the log, lying transversely to the direction of the drain. It was so hard that they had considerable difficulty in cutting it asunder with an axe, a fact which may

easily be realised on inspecting the sample of wood which accompanies this note. It will be observed that the wood is almost black, like the Irish "bog oak," and exactly resembles in texture a solid piece of ebony. When cutting it with the saw, the dust was exceedingly fine, somewhat like that obtained when sawing through a piece of bone. Judging from the appearance of the outer surface of the portions of the log examined by me, the wood is probably that of one of the *Eucalypti*, and if so, it throws an interesting light on the antiquity of this genus of trees, as this example must have been buried many thousands of years. At the spot where the log was met with, the first three or four feet consisted of chocolate soil, which merged into a yellowish clay loam, darkening again at the depth of about 10 feet into a peaty substance. Further up the dyke, however, a thick bed of shingle, intermingled with stones of rounded form about as large as a man's head took the place of this clay; this was probably the bed of the stream, while the bottom of it, where the log became embedded, was no doubt muddy. Higher up, towards the lagoon, and where the depression caused by the old watercourse deepens, and the dyke is consequently shallower, the material excavated is dark peaty soil, which is continued to the edge of the morass. From the whole appearance of the surrounding land the alluvial deposit in question is one of great age, and renders the discovery of this timber at such a depth, and in such a hardened form, of great interest, not only on account of its antiquity, but in connection with the capability of the particular species of tree to withstand decay throughout such a lengthened period.

I append an ideal section of the land lying between the hill called the "Lookout" and the shore of Oyster Bay, showing the position of the dyke, and likewise a section of the dyke itself.

ON THE OCCURRENCE OF THE FANTAILED CUCKOO (*CUCULUS FLABELLIFORMIS*) IN TASMANIA.

By Col. W. V. Legge, R.A., F.Z.S., M.B.O.U.

(*Read August* 10*th*, 1895.)

On the 26th ult. (June), while driving to Swansea with Mr. Wragge, a beautiful adult example of *Cuculus flabelliformis* (Fantailed cuckoo) flew across the road near Apsley. The tract of country being passed through was mixed gum, she-oak (*Casuarina*), and Oyster Bay pine bush, and the cuckoo lodged on a branch by the side of the road, affording us a good view of its plumage. Such a late occurrence of this migrant is worthy of record; it is not probable that it would winter here, for it is noteworthy that several of our summer visitants have been observed in this sheltered region late on into the winter, and the cuckoo that we saw was probably allured into a prolonged sojourn on the East Coast by the mildness of the climate. *Cuculus flabelliformis* (Lath.) is an inhabitant of most parts of the continent, ranging from Cape York to Victoria, and thence westward to West Australia, extending far inland beyond the Murray. It usually arrives in this country at the end of September or beginning of July, and departs again at the end of March and throughout the month of April. I may mention here that Mr. O. Adams, one of our surveyors, saw an example in 1887, at the Piper River, on the 24th July. Whether or not this was an immature bird I am unable to say; if so, there is no doubt that, like many *immature* migratory forms, it had remained behind in the country of its birth.

NOTES ON THE OCCURRENCE IN TASMANIA OF THE "SOUTHERN STONE PLOVER" (*ŒDICNEMUS GRALLARIUS*).

By Alexander Morton.

(*Read August 10th*, 1895.)

The first published list of the birds of Tasmania was printed in the Proceedings of the Royal Society in Vol. III., 1854, page 142, by the Rev. T. J. Ewing, of New Town. In that list Mr. Ewing gives the numbers as follows:—Families, 28. Genera, 114. Species, 169. In 1886 Proceedings, an interesting paper, by Colonel W. V. Legge, R.A., F.Z.S., is published, entitled "Systematic List of Tasmanian Birds." In this list Colonel Legge divided the birds into the following twelve orders: — Accipitres. — The Hawks and Owls, Psittaci, Cockatoos and Parrots. Picariæ— The Cuckoos, Kingfishers, Swifts, Morepork, and Night Jar. Passeres — The Crows, Summer Bird, Thrush, Magpie, Butcher Bird, Thickheads, Flycatchers, Robins, Wrens, Honeyeaters, etc. Columbæ — The Pigeons. Gallinæ—The Quail. Fulicariæ—Native Hen, Coot, Rail, etc. Grallæ—The Snipe, Curlew, Plover, etc. Gaviæ—The Terns, Petrels, Albatross. Steganopodes—The Gannet, Cormorants, and Pelican. Anseres—The Swan and Ducks. Herodiones—The Herons. Pygopodes—The Grebes; and the order, Impennes, the Penguins, making 35 families, consisting of 186 species. Since the above was printed the following birds have been sent to the Museum, being hitherto unrecorded from Tasmania. I give them in the order as they reached me:—(1.) The Semi-palmated Goose, *Anseranas melanoleuca*, first specimen shot at the Lake River, near Cressy, June 20th, 1888. This fine bird, not quite as large as the Cape Barren goose, is found in large numbers inhabiting the swamps and lagoons of Australia. (2.) The Australian Drongo, one of the large flycatchers, *Chibia bracteata*, was shot on the East Coast in 1888. The Magpie Lark of the Colonists of New South Wales, *Grallina picata*, was secured at Stanley in the same year. During the month of May, 1892, a pair of beautiful ducks were shot at Cambridge. On examination they proved to be the Blue-billed Duck of Australia, *Erismatura australis*. Mr. North in his work, entitled "Nests and Eggs of Birds in Australia and Tasmania," page 346, writes:—"This bird is dispersed over the southern and western portions of the Continent of Australia." The latest addition to

the avifauna of Tasmania are a pair of fine specimens of the Southern Stone Plover (*Œdicnemus grallarius*). Although this is the first time this splendid example of the family *Charadriadæ* has been recorded as having been found in Tasmania, it has a very wide distribution on the Continent of Australia, being found at Derby, North-West Australia; Cape York, Rockingham Bay; through New South Wales, Victoria, South, West, and South-West of Australia. The late Mr. John Gould, in his work "The Birds of Australia," writes:—"I should suppose that there is no country on the entire face of the globe, except, perhaps, the Antarctic land, that is not inhabited by some species of this family. From Arctic America, through the course of the Andes, to Cape Horn, species occur." He further states that these birds are allied on the one hand to the Bustards, and on the other hand to the Plovers, and is the largest species of its genus yet discovered, its body being nearly the size of that of a hen pheasant. The flesh is excellent eating. The habits of this species are similar to the one found in Ceylon, *Œdicnemus scolopax*, generally found frequenting sandy plains, crowns and sides of grassy hills, and flats between the mountain ridges particularly. Gould says those that are of a rough and stony character. It is generally met with in pairs, but is occasionally seen in small companies of from eight to ten or more. It is a very shy bird, and runs with great facility, and when not disposed to take wing squats on the ground by the side of a stone or a prostrate log of wood, and there remains so close as almost to admit of being trodden upon before it will rise. Colonel W. V. Legge, in his excellent work on "The Birds of Ceylon," writes of the Ceylon species as being much smaller than the Australian are, and speaks of the Ceylon bird as being excellent in eating. The two Tasmanian specimens proved to be females. The first specimen was kindly sent me through Mr. J. McCluskey, of Spring Bay, having been shot in that locality about last April. The other was obtained at Swansea on the 28th of last month, kindly sent to the Museum by Mr. Frank Morris. Both birds were very fat, and in good plumage, although both the same sex the measurements differed. The bird from Swansea gave the following measurements:—Total length with tail, 22·5; tail, 8; wing, 12; tarsus, 7·6; mid toe, 2·2; culmen, 2·2; bill from gape, 2·5. The Spring Bay bird:—Total length with tail, 20; tail, 8·3; wing, 12; tarsus, 5·4; mid toe, 2·1; culmen, 1·8; gape, 2·3. This addition will give the number of birds known to Tasmania as 191.

NOTES ON FURTHER PROOFS OF GLACIATION AT LOW LEVELS.

By T. B. Moore, F.R.G.S.

(Read 14th August, 1895.)

Before giving notes on my late observations on the above subject, I take the liberty to begin with an extract from a letter by Professor R. V. Lendenfeld, of the University Czernowitz, relative to my paper on the discovery of the first proofs of land glaciation in Tasmania. The views of so able an authority, who was the first to discover positive proofs of land glaciation in Australia, will, I am sure, be interesting to the Fellows of the Society.

Professor Lendenfeld says :—"Your map shows that in the Tasmanian hill country delineated the character of the country, lakes, etc., is exactly alike the character of the Niederen Tauern in Carinthia, Salzburg, and Styria, at an elevation of about 2,500 metres. It is very certain that there—in the Niederen Tauern at that elevation—there have been glaciers a relatively short time ago, and I would say that in the similar country in Tasmania glaciers must have been *very recently*, for otherwise the lakelets would have already been filled up with debris. The glaciation deducible from your map should, I think, be placed in a more recent period than the glaciation of the Australian Alps. As to the glacial evidence itself, anyone acquainted with the subject must agree that the character of the country depicted in your map is a *certain proof* of the past glaciation of Tasmania."

Now I will pass on to discoveries made within the last few months up to the first week in November, 1894, of further proof of land glaciation at low levels, in substantiation of my paper on this subject read before the Royal Society last August.

Upon examination of the banks of the King River, which flows into Macquarie Harbour between Pine Cove and the settled portion of the town of Strahan, I discovered large ice-worn boulders striated and grooved in the deep gorge of the river situated at the Upper Landing ; also similar glaciated boulders in Harvey's Creek at a distance of a quarter of a mile from its junction with the King River at the Landing.

The boulders are large, many tons in weight, and are composed principally of Silurian sandstone. The planed surfaces, grooves, and striæ are fairly distinct, proving beyond doubt that as the ice marks are not obliterated in so

friable a rock that the period of their transposition by ice is of a very recent date. As there are conclusive proofs that the whole mountain chain comprising the West Coast Range has been covered with a vast sheet of ice, we must conclude that rivers of ice have flowed down the damp, sunless, slate gorges of the King River, collecting as they went masses of sandstone from the surrounding heights, leaving them at a altitude of not more than 100ft. above sea level in their present shape and position at the Upper Landing and Harvey's Creek, distant about four to five miles from the range.

In the same locality, on the southern bank of the river, 150ft. above its bed, a large moraine occurs, composed of rocks brought from the inland mountains. Here we find mica slates, large boulders of greenstone, and many other formations not met with in the country west of the coast range. These boulders and pebbles are embedded in a clay or slaty matrix, and have been brought down the river gorge, probably at the beginning of our glacial period, before the erosion of the present bed of the stream.

During the recent substantial improvements to the Strahan-Lyell highway, a very interesting phenomenon of our glacial action has been exposed, through the accumulation of rubbish and moss being removed from the cuttings and drains of the road. As this phenomenon is so accessible on the way to the greatest mine in the island, which many scientists and geologists are sure to visit, it is to be hoped that more able men than myself will give views as to its age, origin, and nature.

A moraine commences about one mile from Strahan, and extends along the road towards Mount Lyell for a mile and three-quarters in width. A portion of the moraine near the surface is composed of yellow clay containing a few embedded pebbles; this rests on a recently formed conglomerate, with a binding of the same coloured matter, in other parts the yellow colour gives place to a conglomeration of pebbles in a blue slaty or clayey nature.

The texture of the binding material or "till" is fine and of rock-like hardness. It contains pebbles of all sizes, from mere atoms up to boulders a foot in diameter; the stones are either rounded, grooved, or planed, and many are covered with scratches and scored in various cross directions. All are of local origin, as no rock foreign to the West Coast can be found. Sheared pebbles of conglomerate and quartzite, similar to those found by Mr. E. J. Dunn, F.G.S., and myself in and derived from the Devonian conglomerate round Mounts Tyndall and Sedgwick are embedded in the moraine matter.

At two and a half miles from Strahan, in a cutting of the road a quarter of a mile from where the "till" is last trace-

able, the best section of the country can be seen. Here an outcrop of the bed rock for the first and only time in the "till" is observed, a blue slate lying at an angle of 80 degs., slightly distorted, but similar in character to the binding material of the glacial conglomerate. At this point we find an illustration of a "giant's kettle," a wide crevasse in the rock filled with "till," the outer wall being at the termination of the deposit. The excavation of the cutting is not sufficiently deep to show the whole depth of the filled-up crevasse, nor to allow me to give an estimate of the probable depth of the whole formation.

During former explorations of the country I found the deposit two miles further distant, in a north-east direction on Gould's old track of nearly forty years ago, re-opened in 1883 by the Meredith Brothers. Taking this and other enumerated facts into consideration, I arrive at the conclusion that the tend of the glaciers have been from the north-east, possibly from the highlands of Tyndall and Sedgwick, which are in that direction, and that the deposit is a moraine profonde, and if not precisely similar to the boulder "till" of the more ancient glacial epochs of other countries, it is the till of a more recent glacial period in ours. The moraines on the edge of Kelly's Basin, spoken of in a previous paper, are similar in character to the one just described, with the exception that as far as I have observed the pebbles are all embedded in a yellow clay.

The recent conglomerate or till on the Strahan-Lyell road is at an altitude of 150ft. to 200ft. above sea level. It is in no way identical with the ancient permo-carboniferous glacial conglomerate found by Mr. Dunn near Mount Read, nor with those referred to in my former paper on West Coast Glaciation as occurring at Mount Sedgwick and near Zeehan. The recent find is composed of rocks belonging to the district, principally slates, dioride, conglomerate, and quartzite, which are embedded in a matrix derived from the wearing down and grinding action of the ice over the local slate rocks, the general formation found in the lower lands of this territory.

The ancient conglomerate contains not only pebbles but large sized boulders quite foreign to the country; it is more consolidated, also of a much harder character, and the binding material is of a gritty sedimentary nature, showing that the deposits were formed under water and have a different age and origin.

After the discovery of the Kelly's Basin moraines and the huge ice-marked boulders in the vicinity of Farm Cove, I was convinced that our glaciers had in some instances descended to sea level, and since the finding of further proofs in the low levels at a considerable distance (18 to 40 miles) from the

highlands, the most sceptical must now allow that the descent of these to sea level has been general.

Let us now consider the evidence we have regarding the age of our glaciation. Professor R. V. Lendenfeld's deductions are, that the glaciation of the Tyndall and Sedgwick country appears to belong to a more recent period than the glaciation of the Australian Alps. If this is allowed we have two glacial epochs in Australasia, or one long continuous period besides the ice age of the Permo-carboniferous era. In Western Tasmania our land glacial action has not been earlier than the Pliocene period, or we should find some evidences in the palæogene deposits round the shores of Macquarie Harbour, especially in the region of the ice-marked and worn boulders near Farm Cove. Let us assume that the glacial action in the highlands is of a more recent date than that of the deposits lately described, accounted for in this way: that the refrigeration of the climate was more intense at the commencement and middle of our glacial epoch than towards its close. During the intense period the ice has not wholly covered the land, but has extended far down into the low-lying valleys, and glaciers have descended even to sea level, or in cases nearly so, as proved by the moraines at Kelly's Basin, Farm Cove, King River, and Strahan. Towards the end of our glacial epoch the climate has become milder and the ice has retired from the lower valleys, still leaving a vast sheet on the highlands, which by subsequent local flows caused the more recent striations, etc., on the bed rocks, and on melting left the extensive moraines in close proximity to the mountain peaks.

The Australian Alps being further from Antarctic influence in a warmer latitude than our West Coast, possibly the refrigeration of the climate there has not been so intense. For, according to Professor Lendenfeld and other authorities, the glaciers have been local, being confined to mountains higher than our own, and the rocks now show less marked signs of ice influence than those in our islands. This would point to the fact that the age of glacial action in the Australian Alps may correspond with the more intense period of our glacial era, for assuming that the climate on the continent was milder, the ice sheets would therefore be confined to the higher mountains, and would probably have melted when our rivers of ice and glaciers disappeared from the lowlands. After the disappearance of all ice from Australia, the highlands of Western Tasmania would still be covered, causing the recent glaciation at the close of our glacial epoch.

Perhaps by some I may be considered an infatuated enthusiast, who has recorded actual facts of observation carefully; granted this is correct, still it is only by actual observation and

the discovery of fresh proofs of glacial phenomena, that the age and intensity of our Glacial Period will be determined.

Trusting my recent discoveries may throw more light on so interesting a subject, and that some eminent authority, not too biassed by past theories, may examine them and give his views, either negatively or in concurrence with my statements, as to the existence of boulder till in the lowlands of the West Coast of Tasmania.

Illustrative specimens forwarded for the Tasmanian Museum from boulder till, Strahan, Lyell-road, viz.:—

No. 1, 2, 3, 4, 5	A series of coloured conglomerates.
6	Binding materials of conglomerate.
7	Scored pebbles from above conglomerate.
8	Sheard Devonian pebbles from ditto.

THE PRIMARY LAW OF VALUE OR PRICE.

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THE PRIMARY LAW OF VALUE OR PRICE.

Reasons Based Upon Statistical Data Showing that Economic Cost of Production—not the Ratio of Demand and Supply—is the Primary Law which Regulates and Determines the Respective Ratios and Prices at which the Precious Metals and all other Commodities and Services Exchange with each other.

By R. M. Johnston, F.L.S.

(Tables and Diagrams.)

Read September 9th, 1895.

Introductory.

No field of inquiry has suffered so much from the lack of uniformity, precision, and proper classification and definition of terms as that branch of art or science which relates to Social Economics. Perhaps these imperfections were unavoidable in the early stages of investigation of matters so complex and variable, and may have been perpetuated by the idea that the popular appreciation of important Social and Economic questions might be aided by the retention of words in common use. The terms Capital, Utility, Wealth, Value, Price, Rent, Profit, Wages Fund, Wages, Interest, Demand, Supply, Cost of Production are of this class, and are still frequently a source of confusion because of the very different meanings which different writers loosely attach to them. Professor Marshall and Gunton, among modern Economists, have done good service in giving greater precision to our language when making use of such generic words, by the adoption of requisite qualifying terms, denoting the specific sense in which the original, or root, term is to be understood.

The terms thus adding greater precision to Economic language are now becoming better understood, and prevent much of the confusion in discussion which formerly was almost unavoidable. The following is a list of the more important of these specific terms now in constant use among Economic students :—

Wealth.—*Wealth in Exchange, or Exchange Wealth, Social Wealth, National Wealth, Cosmopolitan Wealth, Capital Wealth, Consumable Wealth.*

Capital.—*Individual Capital, Trade Capital, Social Capital, Consumption Capital, Auxiliary Capital, Potential Capital, Circulating Capital, Fixed Capital, Personal Capital.*

UTILITY.—*Total Utility, Marginal or Final Utility.*

VALUE.—*Price, Exchange Value, Money Value, Unit of Value, or Ratio or Measure of Exchange, Economic Price, Present Value, Deferred Value, Capital Value, Annual Value.*

RENT.—*Ground Rent, Building Rent, Producer's Rent, Ability Rent, Wages-earner's Rent, Economic Rent, Quasi-Rent.*

PRICE.—*Economic Price, Equilibrium Price, Monopoly Price, Esau Price, Fancy Price, Famine Price, Robbery or Violence Price, the Price of Honour or Virtue, Final Margin of Purchasing Price.*

WAGES.—*Nominal or Money Wages, Real Wages, or Purchasing Power.*

The greater precision which the use of these specific terms, as defined by Economists, affords in discussion is invaluable, and has been the means of clearing up many difficulties.

Notwithstanding the advantages which improved nomenclature have gained for us, there are several important questions regarding which there still exists many conflicting opinions. One of these questions, upon which many controversies hang, is "The Primary Law which regulates and determines the ratios which Economic Commodities and Services exchange with each other;" in other words, "The Primary Law of Price or Value." This is the subject which I have selected for my discourse this evening, and although in the short space which I have at my disposal I can only touch upon the leading features of the question, I hope, by the aid of statistical data and other illustrations, to demonstrate the truth of the assertion which I have ventured to make at the beginning of this paper, viz., "that economic cost of production—not the illusive and indefinite something called the ratio of demand and supply—is the primary law which regulates and determines the respective ratios and prices at which the precious metals and all other commodities and services exchange with each other."

But first it may be useful to inquire :

HOW DOES THE GERM OF ECONOMIC PRICE OR VALUE ARISE ?

At this stage we may with advantage postpone the consideration of the causes which determine the exact exchange ratios or prices of services and commodities, and confine our attention to the investigation of the origin of the initial element of price or value *per se*, irrespective of amount or ratio.

Although Ricardo and Adam Smith did not at first sufficiently qualify their observations to avoid adverse criticism, it is now manifest that their ideas regarding the origin of price and equivalence of exchange require very little modification to be accepted as true by the most advanced economic thinkers of the present day. If we simply substitute "*cost of man's services*," which embraces quality and effectiveness of labour, in place of their original expression "*quantity of labour*," even Gunton, the most recent of thorough exponents of the true origin of the "Primary Law of Price," would give assent to Ricardo's original statement regarding "the equivalence of exchange value," or, as he (Ricardo) states it, "the rule which determines how much of one (commodity) shall be given for another depends almost exclusively on the comparative *quantity of labour* expended on each." Substitute cost of man's service "for *quantity of labour*," and we have the true explanation of the origin of economic price or the "primary law which regulates and determines the respective ratios and prices at which . . . commodities and services exchange with each other."

Ricardo very clearly and succinctly establishes this fundamental truth as to the origin of value and ratio of exchange in his Principles of Political Economy (chap. i. pp. 9, 10. M'Culloch's new edition of "The Works of David Ricardo," 1888) in the following statement:—

"There are some commodities, the value of which is determined by their scarcity alone. No labour can increase the quantity of such goods, and therefore their value cannot be lowered by an increased supply. Some rare pictures, scarce books and coins, wines of a peculiar quality, which can be made only from grapes grown on a particular soil of which there is a very limited quantity, are all of this description. Their value [a] is wholly independent of the quantity of labour originally necessary to produce them, and varies with the varying wealth and inclination of those who are desirous to possess them."

"These commodities, however, form a very small part of the mass of commodities daily exchanged in the market. By far the greatest part of these goods *(fully 99 per cent.)* which are the objects of desire are procured by labour; and they may be multiplied, not in one country alone, but in many, almost without any assignable limit, if we are disposed to bestow the labour necessary to obtain them."

"In speaking, then, of commodities, of their exchangeable value, and of the laws which regulate their relative prices, [b] *We mean always such commodities only as can be increased in*

a. *Fancy Price*, as distinguished from *Economic Price*.

b. Fully 99 per cent. of all commodities in exchange fall within this definition, and are governed by the Primary Law which determines *Economic Price*.

quantity by the exertion of human industry, and on the production (and supply) *of which competition operates without restraint.*" [a]

Ricardo having thus clearly defined the particular domain in which the Primary Economic Law of Price operates, and to which all illustrations which relate to Value and Price should be strictly confined,[b] proceeds to disclose the entry of the basal element of all value and price, which, when incorporated in any material substance by means of detached claim or title, such as money wages or other recognised medium of claim, is thereafter indissolubly united with it as the almost sole measure of its Exchange Value. This basal element of value he discovers in "the comparative quantity (cost?) of labour expended on each" particular commodity, or in maintaining any particular kind of labour service.

Thus he goes on to observe:—"In the early stages of society the exchangeable value of commodities, or the rule which determines how much of one shall be given in exchange for another, depends almost exclusively on the comparative quantity (cost?) of labour expended on each."

The Elemental Ratio or Unit of Exchange.—Ricardo then proceeds to show, by a quotation from Adam Smith, which he accepts, that "The real price of everything, what everything really costs to the man who wants to acquire it, *is the toil and trouble of acquiring it.* What everything is really worth to the man who has acquired it, and who wants to dispose of it, or exchange it for something else, is the toil and trouble *which it can save to himself,* and which it can impose upon other people. . . . . Labour was the first price—the original purchase-money that was paid for all things." Again, "in that early and rude state of society which precedes both the accumulation of stock and the appropriation of land, the proportion between the quantities of labour necessary for acquiring different objects *seem to be the only circumstances which can afford any rule for exchanging them for one another.* If among a nation of hunters, for example, it usually cost twice the labour to kill a beaver which it does to kill a deer, one beaver should naturally exchange for or be worth two deer. It is natural that what is usually the produce of two days' or two hours' labour

a. Where abnormal conditions come in, crippling the reasonable choice or freedom of one of the parties—a forced or absolutely necessary exchange—such as in the exchange of Esau's birthright for a mess of pottage—it might be convenient to define all such exchange value as The *Esau Price* or the *Final Margin of Purchasing Power.*

b. The confusion and opposition of Jevon's and other opponents to Ricardo's theory of "The Primary Law of Economic Price" is due largely to a failure on their part to confine their references and illustrations to the true domain in which the Primary Economic Law of Price operates, and to which Ricardo insisted that it should be confined.

should be worth double of what is usually the produce of one day's or one hour's labour."

In quoting Adam Smith's views, with full approval, Ricardo concludes:—"That this is really the foundation of the exchangeable value of all things, excepting those which cannot be increased by human industry, is a doctrine of the utmost importance in political economy; for from no source do so many errors and so much difference of opinion in that science proceed, as from the vague ideas which are attached to the word value."

The most important corollary to be drawn from such a doctrine is, that all natural elements and their compounds, which form the substance of commodities, whether rare as gold, silver, or tin; or common as coal, iron ore, salt, or water, are, of *themselves*, free gifts of nature, and do not form any part of Value or Economic Price. Man cannot create the elements of material substances, but by his forethought, intelligence, and labour, he can modify and transport, and can provide favourable conditions for the natural increase of specific forms of utility. The latter service of man and its extent merely constitute the *measure of the quality* we otherwise call *value or price* in the particular compounds of natural elements in which, by the laws of Social Economy, it has become so closely incorporated as to be confounded with some supposed intrinsic value in the natural substance *per se*.

The phrase "free gifts of nature" by most people is usually restricted to those things—like pure common air, rain, and sunshine, so necessary to man's life and comfort—which are obtained directly by natural means without the intervention of other men's services; but the acceptance of the doctrine of the Primary Law of Economic Price or Value leads us a step further, and compels us to concede that although all monopolised natural substances in which man's services are incorporated are inseparably associated with Economic Price or Value, the natural elements themselves do not enter into it in any degree whatever; and, therefore, the rarer natural element, *gold, per se*, adds as little to economic price or value as the more common elements, *carbon, hydrogen, oxygen, silica, sodium, chlorine, nitrogen*, etc., do to compounds of common substances, such as coal, common salt, grain, and other food products.

Qualifications to be Admitted.

There are some objections which may be raised, here, against the doctrine that Cost of Production is the Primary Law of

Price, based upon the following considerations, which it may be profitable to discuss :—

First, it is admitted generally as an axiom in economics, that *in the same market there can only be one price for specific articles of the same quality.*

(1) Seeing that the same area of good land may yield A double the quantity of produce grown by B on poor land without any difference in the actual cost of production. How, in the face of "one price for the specific articles of the same quality," can this effect be reconciled with the doctrine that Cost of Production is the Law of Price ?

(2) A similar objection applies to cotton cloth and other manufactures. A, *e.g.*, by the use of superior appliances, may produce four yards of similar cotton at the same cost as it would take B to produce three yards.

(3) Similarly in respect of cost of labour services : Two carpenters of equal skill working at the same bench receive the same daily wages. The maintenance of A with a family to support involves, perhaps, three times the cost of B, a single man, even with the same standard of living.

All these examples would have great force as bearing against the Primary Law of Price were it not that the word "Primary" does not exclude the conception of minor influences which qualify and modify to some extent the operation of the Primary Law. But even the examples given are perfectly reconcilable with the doctrine when stated more completely. For Cost of Production, *i.e.*, economic cost, ignores the variations of actual cost among different producers of the same class of articles as the individuals of the same class working under the greatest disadvantages are the sole determinants of the uniform market price of the common product.

Thus, as regards the price of agricultural products, the normal rate of wages for each class of occupation, as well as the price of manufactured products, are all alike really governed by the same economic law, namely, "*the cost of producing the most expensive portion of the supply necessary to satisfy the same market.*"

The difference of actual cost of production between those in the same occupation, who are working at a greater advantage and those at the greatest disadvantage, is absorbed by the former as an extra reward for services. In the case

of Landowners it constitutes Economic Rent; in Manufacturing and other industries, and in Wage-earning Services it is termed Surplus Profit, or Quasi-Rent.

In none of these cases does the Economic Rent or Surplus Profit so absorbed add in any degree to Economic or Market Price, for the latter is solely determined by the respective representatives of the groups of the same class working under the greatest disadvantage; that is, at the no-rent or no-surplus-profit stage.

I am indebted to Gunton for the following tabular illustrations, which help to reveal more clearly how the marginal differences of cost of production between the same class of producers or workers are absorbed by the more fortunately circumstanced, in the shape of Economic Rent or Surplus Profit, and how the circumstances of the least favoured or "most expensive portion of supply" alone determine the market price.

The Law of Rent. (Gunton.)

"Under conditions of Economic Freedom the rent o land used for any purpose tends to equal the difference between its productive utility and that of the poorest land used for the same purpose in that community, or which contribute to the necessary supply of the same market."—GUNTON.

ILLUSTRATION.

RENT PER ACRE.	SURPLUS PER BUSHEL.	PRICE PER BUSHEL.	COST PER BUSHEL.	BUSHELS PER ACRE.	
Dollars.	Cents.	Dollars.			
6.00	25	1.	Minimum Cost ... 75 c.	24	D
4.00	18	1.	" " ... ... 82 c.	22	C
2.00	10	1.	" " ... ... 90 c.	20	B
0.00	00	1.	Maximum Cost ... ... 100 c.	18	A

The Law of Wages. (Gunton.)

"The law then may be correctly stated thus :—

"The rate of wages in any country, class, or industry constantly tends towards the cost of living of the (average of) most expensive families who furnish a necessary part of the supply of labour in that country, class, or industry."—GUNTON.

ILLUSTRATION.

CENTS.	DOLLARS.	DOLLARS.						
0	2	Maximum Cost ...	...	...			2.00	A
5	2	" " ...	...	...		1.95		B
10	2	" " ...	...		1.90			C
15	2	" " ...	...	1.85				D
20	2	" " ...	1.80					E
25	2	Minimum Cost 1.75						F
SURPLUS PROFIT OR SAVINGS.	NOMINAL WAGES.	ACTUAL COST OF LIVING.	COST REDUCED BY CHEAP LIVING.					

SOURCE OF SAVINGS OR SURPLUS PROFIT.

THE LAW OF SURPLUS PROFIT OF MANUFACTURERS.
(*Gunton.*)

"While the dearest capitalist and the dearest labourer both fix the prices for their class, they both occupy relatively opposite positions. The manufacturers who furnish the most expensive portion of the supply of commodities are the poorest and lowest in their class, while the labourers who furnish the most expensive portion of labour-power are the best and highest in their class, as shown."—GUNTON.

ILLUSTRATION.

SURPLUS PROFIT.	PRICE.	ACTUAL COST (Cents).	COST SAVED BY CAPITAL.				
Cents.	Cents.						
1	4	Minimum Cost 3					F
$\frac{4}{5}$	4	" " ...	$3\frac{1}{5}$				E
$\frac{3}{5}$	4	" " ...		$3\frac{2}{5}$			D
$\frac{2}{5}$	4	" " ...	...	$3\frac{3}{5}$			C
$\frac{1}{5}$	4	" " ...	...	...	$3\frac{4}{5}$		B
0	4	Maximum Cost ...	...	...	...	4	A

SOURCE OF PROFITS.

The illustrations given are of value in giving greater precision to the doctrine of the Primary Law of Price, and helpful in freeing the mind from misconception in the further examination of the rival theory of the Law of Economic Prices, viz., the "Ratio of Demand and Supply." This theory, however fallacious, is plausible, and has the prestige of having been tacitly held or expressly advocated by a very large number of Economists, whose general qualifications are such as to entitle them, at least, to the most respectful consideration, even if their conclusions cannot command assent.

This rival theory claims that Economic Prices are mainly determined and regulated by the varying *Ratio of the Demand and Supply.*

More explicitly. This doctrine affirms[a]:—"(1). That under free competition (*i.e.*, in the absence of arbitrary barriers) there cannot be two prices for the same commodity in the same market"—a proposition common to both of the rival theories; and the same may be affirmed of the next, viz:—(2). That, when the supply and demand are equal, the price is the exact equivalent of the cost of production. The real and fundamental divergence between the rival theories is contained in the third proposition, viz.:—(3.) That the price rises as demand exceeds the supply, and falls as the supply exceeds the demand; and "the rise or fall continues until the demand and the supply are again equal to one another."

The Ratio of Demand and Supply not the Primary Law of Economic Prices.

If the claim that the ratio or relative intensity of Demand and Supply, respectively, is the major influence in determining the rise or fall of Economic Prices over a long course of years, it would need proof to sustain the two following propositions:—

(1) That prices in all cases rise in ratio or proportion as demand exceeds supply in intensity or magnitude, and that, conversely, prices in all cases fall in ratio or proportion as supply exceeds demand in intensity.

(2) That whenever the ratios or intensities over a number of years touch the equilibrium point, that is, are exactly equal, then the price of the particular commodity or service returns to a measure of value which, in itself, is constant and invariable under such conditions.

As regards the first of these postulates, it may be affirmed, with reason, that even if it seems to be true as regards short periods corresponding to the perturbation or fluctuation of

a. Gunton.

seasonal or cosmical influences, it affords no explanation of a general and continuous fall of prices over a large number of years when conjoined with an ever-increasing *real demand.*

Wheat.—Take the commodity *wheat* for example. The absolute measure of the intensity of demand is most surely determined by the extent of its consumption, per head. In the United Kingdom, this intensity of real demand is indicated by the fact that the consumption in the year 1840 amounted to 255lb. per head per year, while its *price* per ton averaged £16·60. The absolute intensity of requirement or demand continued gradually to *increase* to such an extent that in the year 1887 it is indicated by a consumption of 354lb. per head of population, or an increase of intensity of *real demand* equal to 38·82 per cent., while its *price* did not *increase* in the *ratio of real demand*, but actually fell to £8·15 per ton, or a fall of as much as 50·90 per cent., that is, half the price, as compared with the earlier period when the real demand was much less intense.

Meat.—Again we have another anomaly, which, taken with the former instance, is equally unexplainable by what is termed the "scarcity of gold theory of decline of general prices, or by the Law the Ratio of Demand and Supply." Thus in the United Kingdom in the same year, 1840, the average consumption of meat was 87lb. per head, while its market price was £54·5 per ton. Both demand and price gradually increased, *but at very unequal ratios,* until the year 1887, when the average consumption rose to 109lb. per head, or 25·29 per cent. increase, and the market price rose slightly to £58·5, being an increase of only 7·35 per cent.

Average Wages of Agricultural Labour.—A still more remarkable example of inconsistency with either the "Scarcity of Gold" or the Ratio of Supply and Demand theories, and constituting indeed a complete inversion of their theoretical conclusions, is to be found in the United Kingdom, between the years 1840 and 1887, in respect of the rapid fall in demand for agricultural labour generally, associated with not only a gradual *increase* in agricultural labourers' nominal wages, but a still more decided increase in the purchasing power of the same wages.

Thus in 1840 there were 3,400,000 labourers employed in agriculture with average wages at 12s. per week. In 1887, notwithstanding an increase of 38 86 per cent. in the total population, the number of agricultural hands fell to 2,560,000, or a decline of 24·70 per cent., while their nominal wages rose to an average of 15s. per week, or 25 per cent. increase, and while also the real purchasing power *increased* fully 50 per cent. [a]

a. See fuller particulars page 17.

A

PROCRESS OF COTTON INDUSTRY IN THE UNITED STATES Between the Years 1830 & 1880

PARTICULARS		1830	1880	Per Centage Increase or Decrease since 1830	
				INCREASE	DECREASE
Establishments	No	801	756		562
Capital Invested	DOLLARS	40,612.984	208,280.346	412	
Ditto per Establishment	"	50,702	275,503	443	
Ditto per Hand	"	653	1,202	85	
Persons employed	No	62,208	172,544	177.4	
Spindles	"	1,246,703	10,653,435	755	
Cloth produced	lbs	59,514,926	607,264,241	920	
Ditto per Hand	"	950.7	3,519.5	276	
Ditto per Spindle	"	47.6	57	19.7	
Ditto per Dollar Capital	"	1.4	2.4	71.4	
Spindles per $100 Dollar Capital	No	30.7	51.2	66.8	
Ditto per Hand	"	22	62	182	
Ditto per Establishment	"				
Consumption of Cotton Cloth per head of Poputation	lbs	5.90	13.81	134	
Price of Cotton Cloth per Yard	CENTS	17	7		58.8
Operatives Wages per Week	DOLLARS	2.55	5.40	112	
RELATIVE.					
Purchasing Power of Wages operative over the products of his own labour		15	77.1	414	

(P.10)

For further evidence against the two theories under trial, let us study the movements of an important manufacturing industry in another country (United States) in its development between the years 1850 and 1880, or an interval of 30 years, as in the following table, prepared from certain statistics relating to the Cotton industry of the United States, quoted by Gunton (p 263, Principles of Social Economics) :—

(Table A.)

In the accompanying table we have the true cause of the recent fall of prices of commodities most clearly and unmistakably demonstrated. In 50 years the causes at work produced:—

(1.) A fall in the price of cotton cloth of 58·8 per cent.

(2) A rise in the nominal wages of the operatives of 112 per cent.

(3.) An increase of the real wages or purchasing power of the operatives over the product of their own industry of as much as 414 per cent.

Among the more important causes which effected these splendid economic advantages are :—

(1.) The reduction in cost of management by the concentration of the work in fewer but larger and better equipped establishments.

(2.) Improvements in machinery and other auxiliary aids to human labour enabling one hand to control 62 spindles, whereas formerly one hand could control only 22 spindles.

(3.) The effective producing power of each worker by such means was increased 3 7 fold, or nearly four-fold. That means that the labour of producing 1lb. of cloth per hand was reduced 73 per cent.

(4.) The price of cloth was, however, reduced only 58·8 per cent., but the difference of 14·2 per cent. is accounted for by being absorbed by the increase of 112 per cent. in the nominal wages of the operatives.

The "scarcity of gold" theory of the decline of prices cannot be reconciled with these plain facts, for the decline of 58·8 per cent. in cotton cloth is conjoined with an increase of 112 per cent. in the wages of the operatives. The fall of 58·8 per cent. in prices is likewise irreconcilable with the Ratio of Demand and Supply theory, for this remarkable fall

is associated with a growing intensity of real demand, the consumption of cotton cloth per head of population having gradually increased from 5·90lb. in the year 1830 to 13·81 in 1880, or an increase of 134 per cent. of real demand.

Cheapened cost of production—the true Primary Law of Economic Price—is the only theory which harmonises *with all the facts!* Theories like those already referred to (scarcity of gold or appreciation of gold, and Ratio of Demand and Supply), which can only at best be reconciled with a very small part of the facts, must be abandoned as unsatisfactory and altogether misleading. Indeed, when we look at the matter broadly and thoroughly, we must find conclusive evidence to show, in respect of commodities which can "be increased by the exertion of human industry," that supply is subordinate and depends upon demand. The breadth and intensity of the demand determines the breadth or intensity of the supply. The demand for commodities is the measure of the intensity of the need or desire to consume them. Gunton clearly puts it:—"To-day's wants determine to-morrow's efforts, and yesterday's actual consumption determines to-day's actual production. . . Since consumption constitutes the actual demand, and production the actual supply. it follows that demand is the cause (and measure) of the supply." And we might add that the cost of producing the supply is the Primary Law which determines its economic price.

Permanence of the Ratios or Equivalent Exchange Weights of Principal Commodities in Relation to Gold, and also to each other.

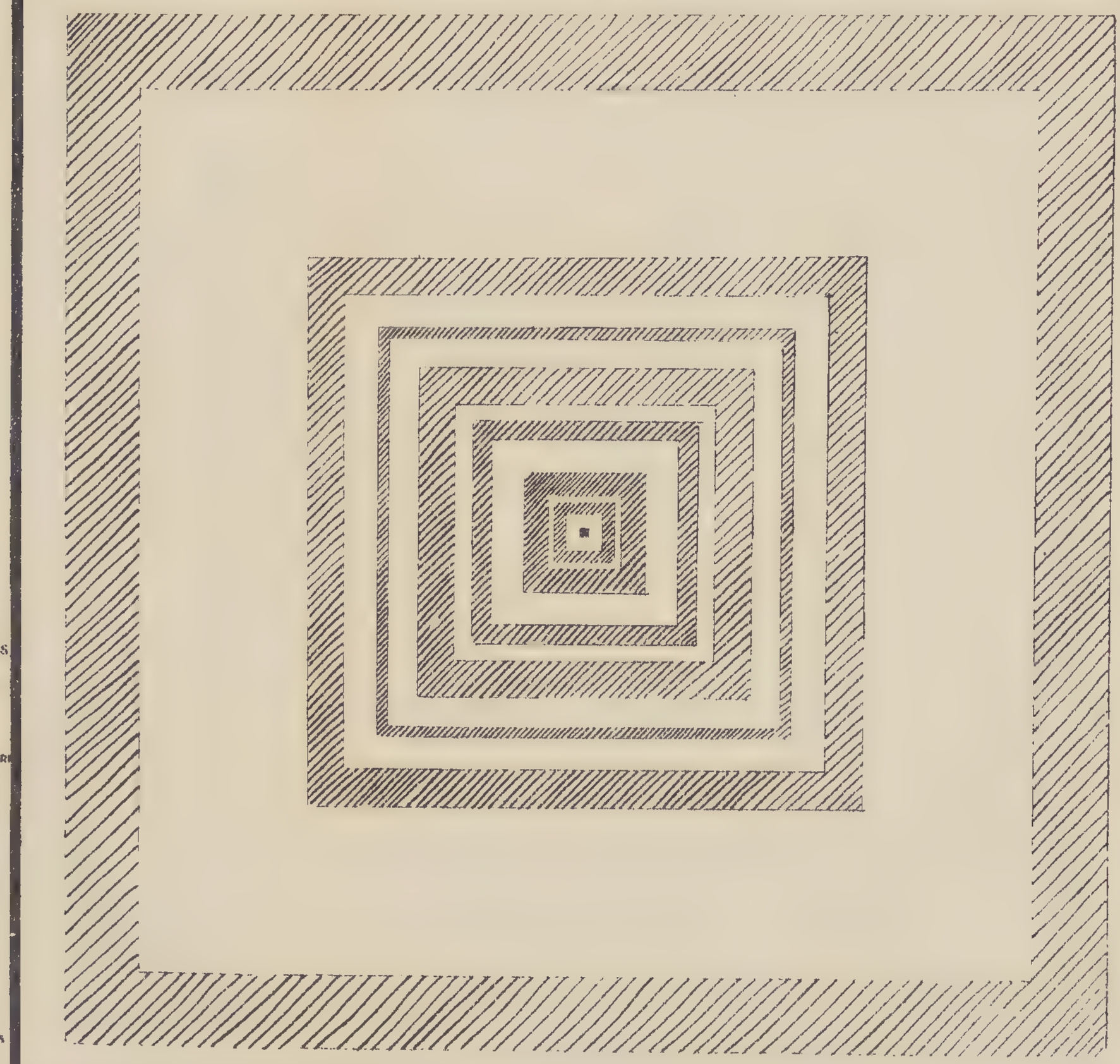
In civilised countries commodities of all kinds, by price lists, have their values equated to the established standard of value,—*gold.* In the United Kingdom the *sovereign* is the principal unit, and has been determined by law to consist of a specified weight (·25682 of an ounce, having $\frac{9166}{10000}$ purity) of the commodity gold, which is also used more extensively for other purposes than money. In general utility, and even in the magnitude of its value as an industrial product, gold is one of the most insignificant and almost the least valuable of all commodities which are requisite for man's use. Its utility is trifling as compared with wood, iron, or coal, and even though costly in relation to quantity or weight, its total value as one of the commodities produced annually by the principal civilised countries is as 19 to 12,507, or 0·15 per cent. of all industrial products.[a] In relation to the annual

a. See appended table showing value of different classes of industrial products

B^A

RELATIVE MAGNITUDE OF THE ECONOMIC VALUE

OF PRINCIPAL INDUSTRIAL PRODUCTS



(P12)

B

Relative value of Products of Various Industries of the Principal Countries of the World.

1887-8	Mil £	Proportion per £10,000
Manufactures	4,618 *	3,692
Agricultural & Pastoral	3,948 †	3,157
Commerce	2,827	2,260
Transport	864	691
Mining	250	200
	12,507	10,000

Details		Proportion per £10,000
Manufactures	4,618	3,692
Commerce	2,827	2,260
Grain	1,091	872
Transport	864	691
Green Crops	859	687
Meat	608	486
Various agricultural Prodˢ	543	434
Dairy	401	321
Garden	259	207
Wine	187	150
Coal	131·2	105
Various Minerals	52	42
Silver	19	15
Gold	19	15
Iron	15	12
Copper	6	5
Lead	3·5	2·6
Tin	2·5	2·
Zinc	1·8	1·4
	12,507	10 000

* Cotton industry £ 281 mil:
† Wheat £ 543 mil:

value of all human services it is still more insignificant, as it is estimated to bear the ratio to them of 19 to 19,334, or 0·098 per cent. Apart from its great utility in barter as a means of facilitating exchanges, and its qualities of indestructibleness and portability, its principal utility is that of a common measure of the value of all other commodities. It is the established handy foot-rule for measuring the value of all other commodities and services, but its own value bears no more comparison in magnitude to the commodities of which it is the standard measure than does the sixpenny foot-rule of the builder or architect to the value of the costly fabric whose various dimensions have been determined by the useful but cheap foot-rule. It is necessary to bear this in mind, because there exists a superstitious idea, widely held, that the real element of economic value incorporated in the substance of gold (*i.e.*, the cost of human services engaged in procuring it) differs in some mysterious way from precisely the same kind of real economic value incorporated in potatoes or any other common commodity.

The magnitude of economic value in any commodity is not determined by its size or weight, nor by its abundance or scarcity, but by the average economic cost, at any time, of the useful services of man absorbed in its production, transport, modification, etc., and thereafter incorporated in the particular substance or commodity in the same way that mortgage title upon a valuable property incorporates the value of mortgagee's money investment.

If it can be shown, therefore, that the ratios of equivalent exchange weights of different commodities with gold and with each other are identical with the ratios of men's time and services absorbed in producing them, the major contention of my argument will be established, viz.:—*That cost of Production—(not the Ratio of Supply and Demand, nor mere abundance or scarcity)—is the Primary Law which determines and regulates Economic Price.*

The usual manner in which different commodities are quoted in price lists, in relation to money value, makes it difficult to realise their relative values to each other. Thus one commodity has its money value expressed in relation to a definite bulk, such as barrel, bushel, gallon. Another to different units of weight, such as ounce, pound, cwt., ton; and the services of man, use of property, money, etc., are always related to a measure of time, such as per hour, day, week, month, or year. Commodities, however stated, can be resolved into one quality common to them all, viz., weight, by which they may be perfectly equated in the relation of the ratios of equivalent weights to unit of value, *i.e.*, to £1, or,

what is the same thing, ·25682 of an ounce of ·916 pure gold. The following table has been constructed by me in this way, and embraces 28 of the principal commodities of English commerce, and representing the most important of all human industries.

(Table C.)

On examining the preceding table, the first thing that arrests attention is the great range of differences of the equivalent exchange weights of different commodities. Thus in 1893 1 ton of gold is shown as the equivalent of 22·23 tons silver; of 1,247 tons tin; of 1,344 tons copper; of 2,628 tons beef; of 7,158 tons sugar; of 7,520 tons lead; of 16,695 tons flour; of 136,000 tons salt; and of 348,636 tons of coal.

The most striking thing, however, shown in the figures relating to the two periods 1870 and 1893, is the permanence or persistency of their relative exchange weights with the central unit of their system—gold—and with each other.

Seeing that all the commodities (excepting their standard, which cannot of itself show variation) have been greatly affected by alteration of prices—some having risen by as much as 59 per cent. (salt), while the greater number of prices of commodities have fallen at various degrees from 4 to 46 per cent.—it is remarkable that the relative value-orbits—if we may coin a suitable phrase—only amount to an exhibition of greater or less eccentricity of orbit; and not (except in one or two instances where the values of commodities lie close to each other) to any disturbance of the original sequence in their order or weight distance from gold, or the centre of the system around which we may picture them as revolving as in the diagram which I have prepared to illustrate this very important law.

(Diagram I.)

THE TRUE LAW OF VALUE OR ECONOMIC PRICE-ORBITS (CORRESPONDING WITH EQUIVALENT EXCHANGE WEIGHTS).

The true law of value or economic price orbits of various commodities relative to the centre of their system—the gold unit—have their equivalent exchange weight magnitudes primarily determined inversely in the exact ratio of their cost of production. That means that the greatness of the radial distance of the commodities from the central unit of value corresponds exactly with the corresponding smallness of cost of production relative to a common unit of weight. Thus the radius of the value-orbit of coal is very great as

C

Equivalent Exchange Weights

of Principal commodities in Years 1870 & 1893. Based on English market prices

Weight of different products yielded in Tasmania per hand.

Commodity	YEAR 1870 Relative Order No	YEAR 1870 Equivalent Exchange Weight	Mean of 1870 & 1893	YEAR 1893 Variation in value since 1870	YEAR 1893 Relative Order No	YEAR 1893 Equivalent Exchange Weight	Tons yielded per hand per year in Tasmania based on the average results of ten years: Actual Wheat Tons	Tons yielded per hand per year in Tasmania based on the average results of ten years: Corresponding Ratio
		TONS	TONS	per cent.		TONS		RATIO
Gold	1	1	1	—	1*	1	0.001405	1.
Silver	2	15.5	18.86	-30	2	22.22	0.032	22.75
Cotton Yarn	3	507	799	-44	6	1,091		
Wool	4	666	946	-39	7	1,227		
Tea	5	703	844	-43	3	985		
Tin	6	864	1,055	-32	8†	1,241	{2.001 / 1.59 to 2.76}	{1424. / 1131 to 1964}
Butter	7	917	994	- 6	4	1,070		
Cotton	8	1,203	1,707	-46	13	2,212		
Copper	9	1,415	1,395	+ 5	9*	1,344		
Tobacco	10	1,612	1,578	+ 4	10*	1,544		
Cheese	11	1,712	1,940	-21	12†	2,168		
Pork	12	1,728	2,135	-35	15	2,662		
Coffee	13	1,746	1,442	+56	5	1,139		
Hams	14	1,811	1,825	-12	11	1,839		
Beef	15	2,513	2,570	- 4	14†	2,628		
Herrings	16	4,351	4,672	-13	17†	4,994		
Sugar	17	4764	6141	-37	18†	7,518		
Fish various	18	5,379	5,014	+11	16†	4,649		
Lead	19	5,431	6,475	-30	19*	7,520		
Flour wheaten	20	7,632	9,433	-32	20*	11,235		
Wheat	21	10,210	13,452	-39	21*	16,695	9.52	6776.
Steel rails	22	13,000	18,447	-46	24†	23,895		
Iron bars	23	13,210	15,207	-33	23*	17,205		
Potatoes	24	16,940	16,817	+ 1	22†	16,77[illegible]	40 8	23040.
Iron ore	25	56,890	107,535	-43	26†	158,150		
Salt	26	219,400	177,750	+59	25†	136,100		
Coal (pit mouth)	27	296,600	322,618	-17	27*	348.636	252. a	179300
Water supply	28	8,500,000 $	8,500,000 $	—	28*	8,500,000 $	330 b	234800

* .. Relative order in relation to Gold and other commodities undisturbed

† ... " " " " " " " scarcely altered

$ ..... Approximately

− ..... Indicates decrease in value relative to 1870

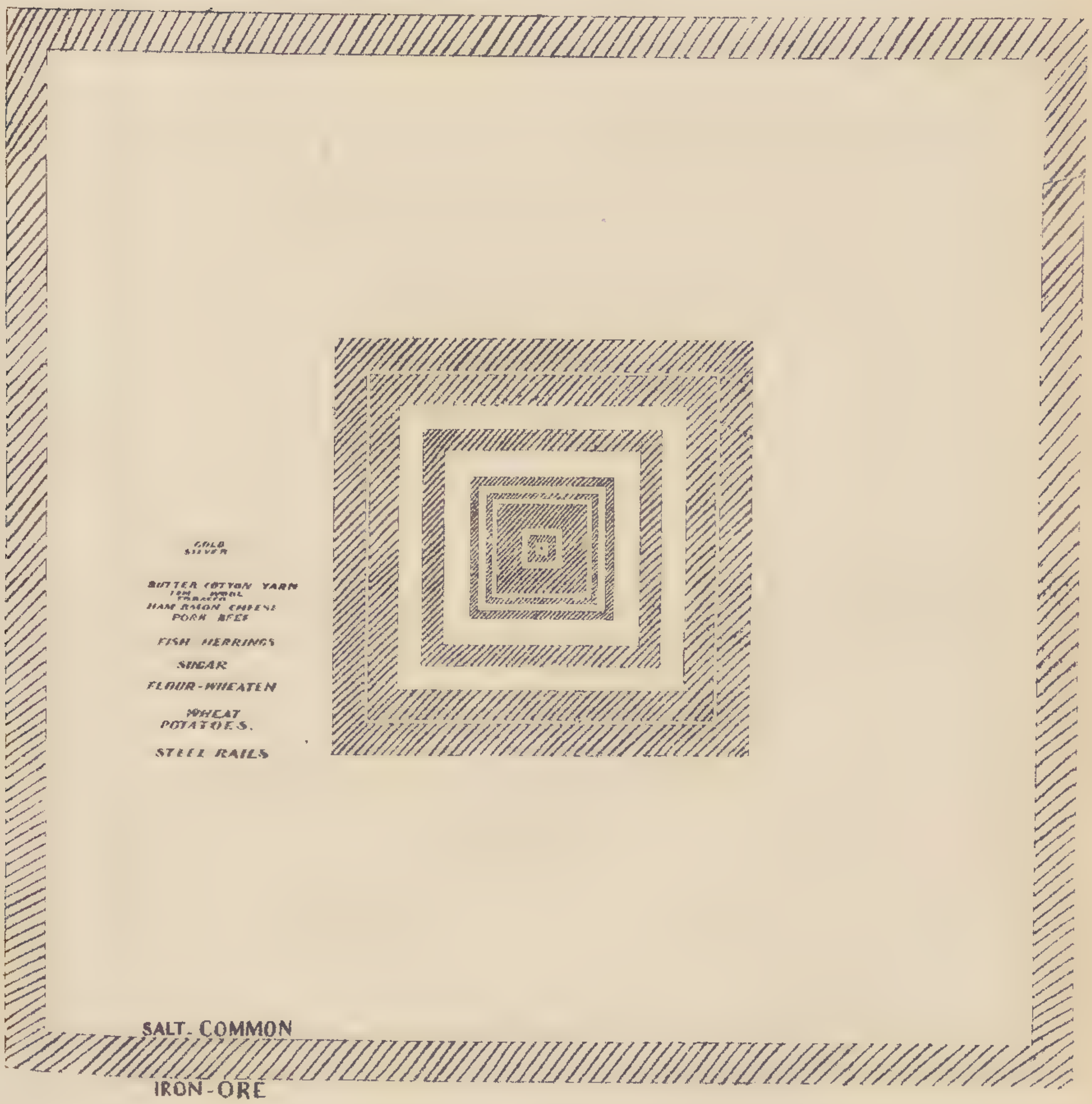
† ..... " increase " " " " "

a. Tasmanian average per man

b. Average of English output per man

WEIGHT EQUIVALENTS OF EXCHANGE PER STANDARD MONEY UNIT ※

※ SOVEREIGN = 0·257 Oz: GOLD OF .916 degrees FINENESS
= 0.0000095610 TONS GOLD

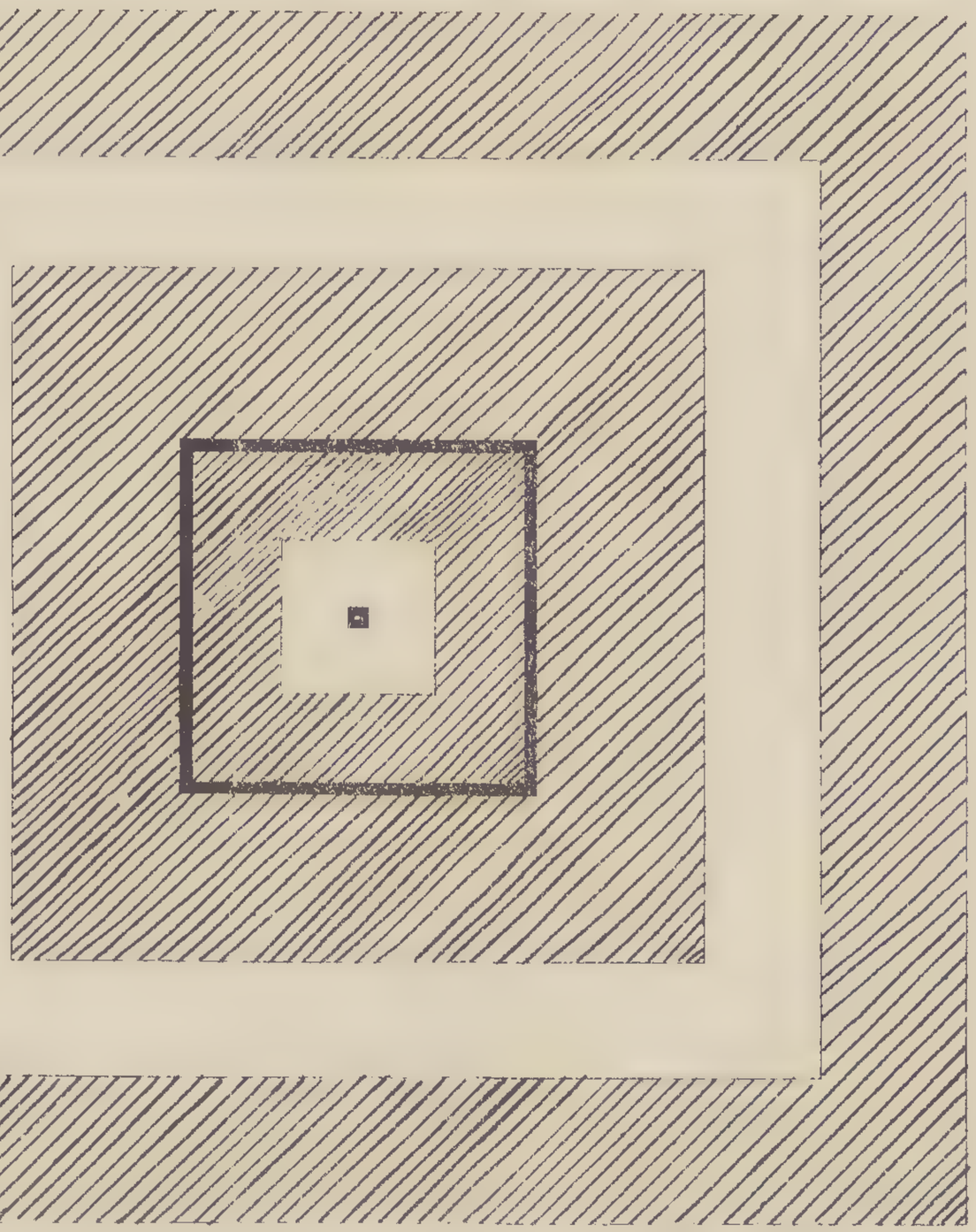


(P.13)

I.

WEIGHT EQUIVALENT PER STANDARD UNIT OF LABOUR-TIME ※

(※ AN AVERAGE YEARS LABOUR OF ONE MAN)



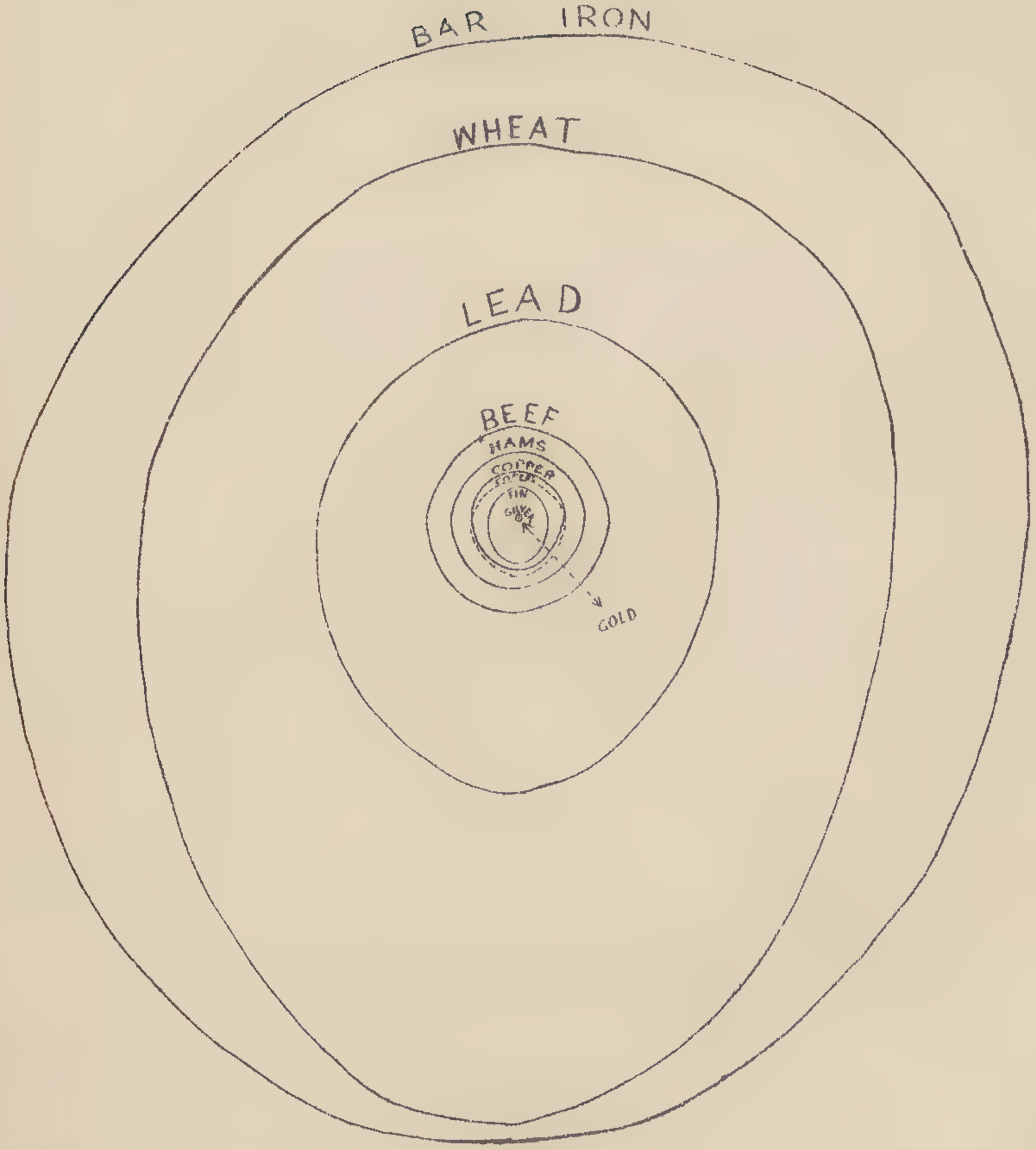
AVERAGE WEIGHT PRODUCED PER MAN PER YEAR TONS	
0.001405	GOLD
0.032	SILVER
2.001	TIN
9.46. 9.52 10.78: 11.18: 11 18	OATS: WHEAT PEASE: BARLEY & BEANS
40.8	POTATOES
72.9	TURNIPS
124.07	MANGEL-WURZEL
252.0	COAL

(P.14)

VALUE ORBITS OF EQUIVALENCE OF VARIOUS COMMODITIES IN RELATION CENTRAL UNIT OF VALUE (GOLD) AND TO EACH OTHER

THE RESPECTIVE ECCENTRICITIES INDICATE THE DIFFERENCE OF PRICE-RANGE BETWEEN YEARS 1870 & 1893.

I^A



compared with the centre gold and with the respective value-orbits of silver, tin, wheat, and potatoes, because the experience of the producing industries of England and Tasmania during the last ten years proves that one *hand* during a year on the average can produce :—

ACTUAL.		EQUIVALENT RATIO TONS.
330	tons coal	234,800
0·001405	of a ton of gold	1
0·032	of a ton of silver	22·75
2·001	tons tin (metal)	1,424
9·52	tons wheat	6,776
40·8	tons potatoes	29,040

It is remarkable, notwithstanding the local differences of market prices and rates of current wages of the different industries, how closely the ratio of producing effort, taken inversely, agrees with the ratios of the selling prices in the English market. Any person who takes the trouble to examine this matter closely must be convinced that it amounts to a perfect demonstration that Cost of Production is the Primary Law which determines and regulates Economic Prices or Values, and that this law *can alone account for the remarkable permanence of the ratios of equivalent exchange weights of the principal commodities in relation to gold and to each other.*

It also alone satisfactorily accounts for the constancy or varying eccentricities of value-orbits over long periods caused by the rise, fall, or stationariness of prices of different commodities.

The True Cause of the Recent General Decline of Prices.

Persons who are unable to afford the time to give more than a superficial examination of such an important economic subject as the Recent General Decline of Prices in respect of which we are constantly deluged with the controversies of loose and inexperienced writers, may be apt to refer, without sufficient reflection, certain effects to one out of several possible causes.

Uniform decline of Prices.

For example, uniform decline of prices of commodities might be produced by any one of four very different conditions as follows :—

(1.) By a *uniform reduction* in cost of producing various commodities, with the exception of gold, whose cost of production is assumed to remain unchanged.

(2.) By cost of production *remaining unchanged* in regard to all commodities, excepting gold, whose cost of production had increased absolutely.

(3.) By a *uniform increase* in cost of production of various commodities, but associated with a still more marked increase in the cost of producing gold.

(4.) By a *uniform reduction* in the cost of producing various commodities, excepting gold, whose cost of production had declined at a lesser ratio.

(Diagram II.)

Now, whether we accept or reject one or other of these four possible causes, the relative purchasing power of commodity over commodity, excepting gold, would not be disturbed in the slightest degree. Even in respect of gold, it is only the industrial part which would be economically altered. The position reserved for money, by its appreciation, relatively, as in example 1 and 4, and absolute appreciation as in examples 2 and 3, would not in any way disturb their exchange values with each other in any way.

If nominal rates of wages and nominal profit fell uniformly, or rose uniformly with prices under all these differing conditions, the wage-earners' or investors' purchasing power would also be undisturbed, however higher or lower his nominal wages or rates of profit might be. But if nominal wages and nominal profits remain stationary while nominal prices fell generally, the industrial world would be greatly improved, because it would mean a real increase in the purchasing power of man's services. And as fully 70 per cent. of breadwinners buy commodities with services, not with commodities, we have no reason to doubt the largeness of the benefit to mankind from a general reduction of prices of commodities under such circumstances.

Any disturbance or depression of trade is therefore due to other well-understood economic causes, occurring periodically in cycles, and is in no way due to a general decline in prices.

Decline in Prices, Not Due to Absolute Appreciation of Gold.

Although there is a very marked decline in recent years in the prices of commodities, the rate of decline is far from being uniform in respect of different commodities.

II

ILLUSTRATIONS SHOWING THAT
SIMILAR RELATIVE EFFECTS
May be produced by
VERY DIFFERENT CAUSES

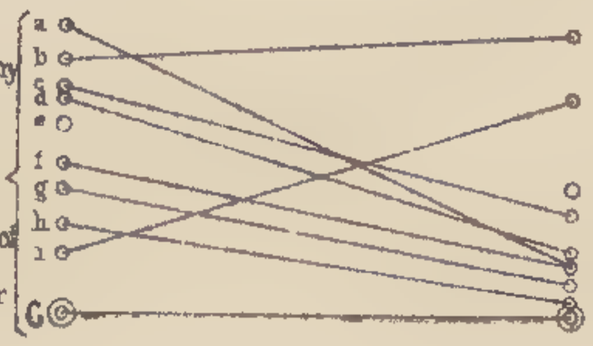
PURCHASING POWER OF GOLD

REFERENCE:- G. *indicates Gold,*
a.b.c.d &c .. *other commodities*

— EXAMPLES —

PRICES OF OTHER COMMODITIES

I P.P increased lowered or stationary accordingly as prices of other commodities, have fallen, risen or remained stationary, its own cost of production remaining stationary or unchanged.



Some increasing irregularly a few stationary the larger number falling irregularly P Power over Gold & with each other varying as the prices vary & as the cost of production.

II Cost of Production Remaining Stationary Increased Purchasing Power over other commodities

Falling Uniformly relative to Gold Purchasing Power over each other unchanged owing to cost of production having fallen uniformly in all industries

III Appreciated or Increased P Power owing to increased cost of production.

Produces the same results as indicated by example **II** but owing to cost of production remaining unchanged in all industries

IV Greatly appreciated P. Power owing to a correspondingly great increase in cost of production

Produces the same results as indicated by example **II** but owing to cost of production having uniformly risen in all industries but with a smaller intensity than the current rise in the cost of production of Gold

V Appreciated or Increased P Power even with reduction in cost of production

Produces the same results as indicated by example **II** but owing to cost of production having uniformly fallen in all industries but at greater rate of intensity than in the con-current fall in cost of production of Gold

G. Whitlock

(P 15)

Thus, between 1873 and 1893,

The price of	Steel Rails	declined	46	per	cent.
,,	,, Cotton	,,	46	,,	
,,	,, Tea	,,	43	,,	
,,	,, Wheat	,,	39	,,	
,,	,, Sugar	,,	37	,,	
,,	,, Beef	,,	4	,,	
,,	,, Butter	,,	6	,,	
,,	,, Coal	,,	17	,,	
,,	,, Potatoes	increased	1	,,	
,,	,, Copper	,,	5	,,	
,,	,, Tobacco	,,	4	,,	
,,	,, Fish	,,	11	,,	
,,	,, Coffee	,,	56	,,	
,,	,, Salt	,,	59	,,	

This demonstrates that the fall in price of important articles, such as rails, cotton, tea, wheat, and sugar, cannot be due to the alleged appreciation of gold, for the latter cause would tend to produce a uniform fall in all prices.

If this be true, and if it be also admitted that cost of production is the true primary law of economic value or price, then it may be confidently affirmed that any attempt made by governments to fix arbitrary laws for determining the relative exchange values of any two commodites—such as gold and silver as in the scheme of bi-metallism—would be as futile as to pass arbitrary laws for determining their absolute specific gravities. Of course, I except the useful *token* relation of silver to gold, where one is subordinate to the unit standard, and limited in amount of tender as money.

The true cause of decline in prices is mainly due to the increasing improvements in steam, chemistry, electricity, and labour-saving machinery and forces, whereby man's labour is year by year made more effective, his reward is made greater, and his wants more abundantly satisfied in proportion as prices of commodities decline. Whatever local injury is now done to particular countries, or to particular industries in any one place, is due to the introduction of more favoured competitors in the same region, or in the same branch of industry, and not to the causes which are so frequently alleged. As a single example of the wonderful advantage to the effectiveness of man's labour by the introduction of labour saving forces and machinery, let us take the case of steam. It is estimated that the steam force now employed as an auxiliary to man's labour has multiplied the original power more than fifteen fold. When we realise that in the United Kingdom alone, since 1840, 8,600,000 additional horse-power is employed in transport, and in other industrial directions, represents the added nominal force of

103,000,000 of workmen, or fully six times the working force of all breadwinners in the United Kingdom, need we be surprised to find that even the effective power of the agricultural labourer, who is not so highly benefited as the artisan class, has been increased 42·93 per cent., and that fewer hands, therefore, are now required to cultivate each acre. Ought we not to expect, also, as we find it to be, that the new facilities must have immensely cheapened transport and cost of production; raised wages and purchasing power; increased the average consumption; and greatly improved the standard of living of the labourer. By such improved conditions, the United Kingdom is now better enabled to employ, feed, clothe 38 millions than in the year 1841, when there were 10 millions less to employ, feed, and clothe.

Conclusion.

In conclusion, I may be permitted to quote the following interesting passage from the author of "RECENT ECONOMIC CHANGES" (David A. Wells), who is acknowledged to bé one of our most distinguished economists, in order to show that my own opinions are in harmony with those of the most advanced economic writers of the day. Mr. Wells, in his concluding summary of "The Single *versus* the Double Standard," states: "To comprehend the phenomenal reduction in the prices of the world's great staple commodities which has taken place in recent years, it is essential to *look for and consider more potent and extensive causes than any variation in the volume or relative values of the money metals,* great as they may have been."

Mechanical and chemical appliances have been invented, developed, and applied for the production and distribution of commodities within the last quarter of a century, which prior to that time had hardly formed the subject of rational speculation. The prime object of all these inventions and discoveries, *the great stimulus that led to their realisation, was to Cheapen cost, or, what is the same thing, reduce prices.* And the measure of the value of any new industrial method, invention, discovery, appliance, or development is the extent to which these results are effected by it.

Thus, the "prices of cloth fell when the spinning-wheel and the hand-looms were superseded; the price of travelling when steam superseded horses and the power of the wind. The prices of all the world's great staple commodities fell when steam connected the chief sources of their supply with the market places of all nations, and made possible the wide distribution of perishable products. The prices of all things, again fell *pari passu,* with the growth of financial iustitutions established to create the supply and use of metallic money."

"The investigations of Mr. Atkinson show that 'while one-half the present effort to sustain life consists in the effort or cost of obtaining food, that effort, great as it still is, is so much less than it was prior to 1860 as to make it almost incapable of expression in specific terms. In 1860, the greater part of the wheat now consumed in Europe could not have been moved a hundred and fifty miles without exhausting its value; now wheat is moved half-way round the world at a fraction of its value.' The preservation of food by artificial methods, which to an extent is equivalent to its increase supply, has also been to a very high degree perfected."

"In the production of materials for clothing, vast areas of new territory have been added to areas formerly occupied for the production of cotton and wool; while, in the case of cotton, the change from slave labour to free labour alone has greatly reduced its cost of production in that country whose supply determines the price for the world. 'In the conversion of cotton and wool into fabrics it can be proven that one factory operative can do four times the work that one corresponding operative could accomplish between the years 1840 and 1850; while the invention and application of the sewing-machine has reduced the time and labour cost necessary for the conversion of cloth into clothing in vastly greater measure.'"

"In the case of the useful metals, iron, steel, copper, lead, tin, and quicksilver, the revolution which has occurred in consequence of the discovery and opening up of new mines, the application of new methods of smelting, and the facilities for transportation *at low cost*, have unquestionably reduced the cost (price) of all these products to as great an extent as that of any other class of commodities."

Mr. Wells then concludes his argument as follows:—

"To suppose, now, that a change in the relative value of the two precious metals—gold and silver—a change which has not in any degree restricted their natural supply or diminished their monetary or industrial uses, has exercised a concurrent superior and predominating influence in respect to the prices of all other commodities, or services, would seem to be almost incompatible with the clear exercise of one's reasoning faculties."

I am glad to be be in complete accord with the views so admirably set forth by Mr. Wells, and I am, at the same time, fully convinced that any cause which tends to check the influences which have beneficially cheapened commodities to consumers, also tends to check the world's progress in material welfare.

DISCUSSION.

Mr. A. J. Ogilvy said:—Mr. Johnston's opening statement (condensed) is that cost of production, not demand and supply, primarily determined prices. Later, he qualified that by excluding things the cost of which was determined by scarcity alone, confining it to things which could be increased (indefinitely, I suppose), and where competition operated without restraint. In short that, just as south of the tropics the wind would always blow from the west if th re were no land to disturb, and just as every planet's orbit would describe an ellipse if there were no other planets to perturb, so price would always represent cost of production measured in labour if there were no natural scarcity or artificial interference. Mr. Johnston has proved this conclusively, but the case thus qualified seems so plain from the mere statement of it that one was surprised to hear that it required proof, and I suspect that the dispute, where there is any, arises from neither party quite understanding the other's position; for the law of demand and supply and cost of production are not rivals at all, but each is the complement of the other. There is not a farmer or shopkeeper during the bad times whom you will not hear recognising clearly the first half of the law of demand and supply, viz., that people will not go on producing goods for less than their cost of production; and though he may not quite so quickly recognise the second half, viz., that trade competition will not allow anyone to continue getting more than cost of production (plus margin of profit); this is only because business in real life is so full of monopolies, natural and artificial, legitimate and illegitimate, that he takes these disturbances as matters of course, and does not trouble himself to recognise that, where there is a continuous and excessive profit, there *must* be a monopoly of some sort, otherwise other people would have rushed into the business and brought profits down. Still he sees it plainly enough directly it is pointed out. So that he accepts the law of cost of production in full. For all that he sees at the same time that when things that are wanted are plentiful they are cheap, no matter why they are plentiful; and that when they get more plentiful still, no matter why, they get cheaper still, and *vice versâ*; and also that if they are less wanted (supply remaining the same), they again also get cheaper. In short, he also believes in the law of demand and supply, and attends chiefly to that as the broader law that includes and covers the cheaper. For the law of demand and supply is this —that just as the steam, as such, is the sole governing power of the movements of the piston-rod, notwithstanding that behind the steam is the fire that creates the steam, so the ratio between demand

and supply, as such, was the sole governing power of the movement of price, notwithstanding that behind demand and supply was cost of production that regulate supply. As the fire can only influence the piston-rod through the steam, so cost of production can only influence price through supply. Only there is this difference, that whereas fire only can create steam, other things besides cost of production determined supply. So that it is demand and supply, as such, only that determine price. To show this, take first reduced cost of production without increase of supply. Suppose I own the Blue John Mine, the only mine in the world that yields Derbyshire spar, and that I discover a way of reducing the cost of the work by half, but do not increase my output, only lessen my expenses, then demand and supply being unaffected the price remains unaltered, notwithstanding the reduced cost of production. Or suppose I discover a process by which I can make silk from mulberry leaves direct and keep my process secret without increasing my output, the same result happens. Now take increased supply without reduction of cost. Suppose a diamond field, where the difficulties of finding the diamonds are so great that only a limited number of people take to the business, and the price of diamonds stands at so much; and suppose now another diamond field, just like it, is discovered elsewhere with just the same difficulties and the same profits; then about the same number of people start diamond hunting there, so the supply of diamonds being doubled the price falls, notwithstanding that cost of production is exactly what it was. A law like this of demand and supply covers all cases, disturbances included, is at least as important as forming, one may say, one that, like cost of production, can only be applied after all disturbing influences have been excluded. Economics, to be worth studying, must be more than an intellectual exercise for the few, it must afford a useful guide for the many; and just as the sailor wants to know not how the winds *would* blow if things were different and there were no land (though that is good and useful, too, in its way), but how and why they DO blow so variably, so uncertainly, so bewilderingly, so what the man of the world wants to know is not what prices would be if things were different and there were no disturbing influences, but what does actually determine them under all the innumerable and ever-present influences of natural scarcity, artificial monopoly, privileged obstruction, protective duties, rings, and syndicates, sudden changes of fashion, slow changes of custom, disappearance of species, and a thousand other interfering agencies, all which are not confined to a one per cent. class of articles, but enter more or less at one stage or another into every single article of commerce. And the simple law of demand and supply

covers them all; all at least with (so far as I can see) one solitary exception. As to the exclusion of things the value of which is determined by scarcity, the doctrine of demand and supply is that the value of EVERYTHING is determined by its scarcity as compared with the demand for it. If there is no demand for it it will have no value, no matter how scarce it may be. But the exclusion is evidently meant to apply to things that are wanted, and that are obtainable to a certain extent, yet the supply of which cannot be increased. But the disturbances and interferences with free production are not confined to these articles (if any such articles there be), they appear everywhere. Food, clothing, and houses, for instance, are typical examples of the things that, in theory at any rate, can be increased indefinitely. There is no natural scarcity of these things, but there is a terrible artificial scarcity. This is why we are saddened with the sight of unemployed men, without food, which they could and gladly would produce; without clothes (beyond what is on their backs), which they would gladly make; without homes, which they would gladly build—if they were allowed. All these, and nearly every other theoretically obtainable good thing which men cannot get are scarce because the opportunities to produce them are *made* scarce; and the man who could but may not produce them, if he is to get them at all, must pay a high price for them; not perhaps a high price measured in money, but a high price measured in labour, that is, he must give many more hours' work for them, or for the money to buy them, than he need give but for obstruction. Now we want a law that shall cover all these cases. The law of demand and supply is the only one that does so. Now take the three examples given to dethrone demand and supply from its hitherto recognised position: 1st. Wheat, the demand for which, as indicated by consumption, rose, after 1840, in 47 years by one-third, while its price fell to half. Why? Through the law of demand and supply. Because increased supply (no matter from what cause) had brought down price, and in doing so had stimulated demand. For it was about that time that the prairie lands of North America began pouring their supplies into the English market. It was the increased supply as such, not the diminished cost as such, that produced the result, for if a ring had bought up the imports and held back half, or if foreign war vessels had intercepted half, the price would not have fallen as it did, notwithstanding the diminished cost of production. And here I may say, though it is not strictly relevant to the question before us, that I doubt whether there was any diminished cost of production measured in labour. I doubt much whether it took any less labour to raise a bushel of wheat on the prairie, send it by cart to the railway, by rail to the seaports, and by

sea to the English market, than it did to raise a bushel *at* the English market. A large part of the previous price represented rent. Not that the high rents CAUSED the high price, it was the scarcity that did that; but the landlord got the benefit all the same, and when the increased imports brought down the price, the landlord lost and the consumer gained the difference. As to the next example, meat, the same argument applies. The arts of tinning and freezing meat had been discovered, and shipments of live stock greatly increased. The increased supply, not the reduced cost, checked the rise of price. As to the third example, the increased rate of wages coupled with increased purchasing power, that is too wide a question to enter on here. I content myself with remarking that the increased wage and increased purchasing power were a good deal less than they appear, being largely discounted by increasing rent, by increasing irregularity and uncertainty of employment, and in many, especially in the most conspicuous cases, by contributions to the war fund of the Union, by which the rate of wage was kept up. However, let us keep to the main point, which is that, looking at the matter broadly and taking price as a whole, as it actually is with all its disturbing influences, not as it might be without them, it is demand and supply as such that determines it ; cost of production acting only by affecting supply, and so disturbing the ratio, besides being only one factor out of many, though no doubt the chief one, in affecting supply.

BOTANICAL NOTES.

By L. Rodway.

(Read November 25, 1895.*)*

In a paper I had the honour of reading early this year, I alluded to a grass from Adamson's Peak that appeared distinct from any described form. I am now convinced it is an alpine variety of the scarce grass described by Brown as *Tetrarrhena juncea*, and as such is of greater interest than if it had been specifically distinct, all the more so to us as it upholds the wisdom of our respected botanical head, Baron von Müeller. Brown, guided by a similar train of thought to that which directs more modern specialists, was a great genus maker as well as species maker. There was rather a tendency to make genera on artificial lines. Thus he removed from the well marked genus *Ehrharta*, of Thumberg, sundry forms that differ inessentially from that genus in bearing 4 instead of 3 or 6 stamens in the flower. Of these those that bore a loose inflorescence he placed in a genus as *Microlæna*, and those whose flowers were arranged in a spike or spike-like raceme were formed into a genus *Tetrarrhena*. A long time after this Gnnn found a grass undoubtedly new that was close to *Microlæna*; but having out 2 stamens, Hooker in describing it thought it necessary to erect a new genus, *Diplax*, for its reception. Müeller, following Sprengal, has long ago returned these genera to *Ehrharta*. The grass I found on Adamson's Peak is in all essential details a stunted *Tetrarrhena juncea* of Brown, but it has a panicled inflorescence, and the androecium is reduced to a single stamen, making it necessary to form a new genus for an apparent variety, or to accept the teaching of von Müeller and return to the single genus *Ehrharta*.

Lepturus cylindricus, Trin. This littoral and marsh grass, which is common to temperate Australia, Cape of Good Hope, and the Mediterranean, is widely distributed in Tasmania, with its ally, *L. incurvatus*, Trin., from which it differs in the spikelets possessing a single outer glume. It is doubtless indigenous.

Cynodon dactylon, Pers., referred to in the appendix of Spicer's Handbook as a recent introduction, has so long been known in out-of-the-way localities that it is better considered indigenous. Bentham so treats it as Australian in his Flora Australiensis.

Page 103, line 5.—For bracleypodium, read *brachypodium*.

" 104 " 33.—For natricaria, read *matricaria*.

" " " 39.—For lepdium, read *lepidium*.

" " " 31.—For arvensis L. restbarrow, read *arvensis L. restharrow*.

Amongst introduced grasses that are widely spreading are :—

Kœlaria phleoides, Pers., throughout central districts and islands of Bass Straits.

Bracleypodium distachyum, R. et Sch., on the Domain in and about the Botanic Gardens. Referred to in Spicer as a *Triticum*.

Gastridium lendigerum, Beanv., the common nitgrass of the northern hemisphere, is dispersing itself in the Berriedale neighbourhood.

Panicum sanguinale, Linn., a fingered grass of world-wide distribution, is appearing in a few districts.

Polypogon littoralis, Linn., is also becoming common on the river swamps below Bridgewater.

Lepidosperma falcata, n.s. Densely tufted. Leaves flat, not acute, about $\frac{1}{2}$ to $\frac{3}{4}$ line diameter, spirally curved, about 6in. long, stems similar. Panicle simple, few flowered, each pedicel curved. Glumes few, obtuse, inner pair much exceeding the rest and widely gaping when the nut is mature. Nut shining, obscurely triquetrous. Hypogynous scales thick and short below the nut as in *L. lineare*. Common in poor soil, in healthy and stony places in Tasmania.

It is with considerable hesitation I describe this as specifically distinct from *L. lineare*, R. Br.; but it could not be included in that species without also including both with *L. laterale*, R. Br., a clubbing hardly justified though natural.

Carex barbata, Boott. Tufted. Leaves about 1ft. long, rather narrow, without a conspicuous mid-rib, margin scabred. Stems slender, 12-18in. high. Spikelets few, stalked, the upper one male, but often bearing also a few female flowers; the female spikelets often with few male flowers at the apex, about 1in. long. Glumes and utricles similar to those of *C. gunniana*, Boott, but the latter only half the size.

Common in swamps at Claremont and Longley.

This species, which I apprehend to be the *Carex barbata* of Boott referred to in Bentham's Flora Australiensis, lives with *C. gunniana*, and though similar in general habit, is most undoubtedly distinct from that species.

Corysanthes unguiculata, R. Br. This rare and interesting little orchid occurs near Kingston, in damp heaths, and will probably be found in suitable localities.

In the transactions for 1893 I drew attention to the artificial basis upon which the species *Thelymitra longifolia*, Forst., and *T. aristata*, Lind., besides numerous other now suppressed species, were maintained to be distinct from *T. ixioides*, Sw., I endeavoured to point out by means of dissections taken from numerous plants the totally unreliable details upon which those species were founded. I have since obtained specimens from Clarke Island, Bass Straits, and near Strahan, in which the upper hooded portion of the column wing is exceptionally well developed, and the lateral lobes are entirely suppressed. This necessitates the raising of this variety into specific rank, or reducing the forms *T. aristata* and *T. longifolia* to inconstant varieties of *T. ixioides*, Sw.

Amongst introduced plants the following deserve attention:—

Trichonema roseum, Ker. A pretty little lily-like iris, with pinkish mauve flowers, steadily disseminating itself in pastures. It is often passed by as a pink form of the harmless little white lily of spring, but I am assured by von Müeller that it is poisonous, and should be eradicated.

Euphorbia larthyris, L., the caper-spurge, probably responsible for some of the cattle poisoning that has taken place lately. It is naturalised in many parts. Its powerful cathartic qualities are dangerous.

Nepeta cataria, L., catmint, is found in some parts.

Gilia pungens, Hook., of South America, a prickly little herb of certainly no useful qualities, has made its appearance in the central districts.

Helminthia echioides, Gaert., a useless thistle and *Ononis arvensis*. *L. restbarrow*, whose habit is well expressed by its name, are also with us.

Hatricaria discoidea, D.C., a composite with conical inconspicuous flower-heads, is becoming very common about the suburbs of Hobart. It has medicinal properties like its allies.

Erigeron linifolius, D.C., is also a common composite but harmless weed very common about Hobart.

Lepdium draba, L., is common at Cornelian Bay and Sandy Bay.

Linum catharticum, L., is establishing itself in one or two places.

ON THE NEW GENUS PETTERDIANA.

By John Brazier, F.L.S., C.M.Z. Soc., London, Corr. Mem. Roy. Soc., Tas.

In the year 1887 Mr. C. F. Ancey, in his descriptions of new genera and sub genera of the Helicidæ, published in the Conchologists' Exchange, Vol. ii., p. 22, defined and named a sub genus of *Endadonta* from the Caroline Islands under the name of *Brazieria*. Mr. W. F. Petterd, in his contributions for a systematic Catalogue of the Aquatic Shells of Tasmania in the Proc. Roy. Soc., Tasmania, p. 76, 1888, defined and named a new genus of the family *Amnicolidæ* under the name of *Brazieria*. Mr. Ancey's name having priority, I take the pleasure of re-naming the aquatic Tasmanian genus after my very esteemed friend, correspondent, fellow voyager and companion, Mr. William Frederick Petterd, of Launceston, Tasmania.

Petterdiana, Brazier.

"Shell globosely rounded, solid, imperforate; spire small, body whorl large; aperture very oblique, effuse; outer lip acute, inner lip thickened; operculum horny, subspiral, animal (?)"

Type: Ampullaria tasmanica, Tenison-Woods.

Petterdiana tasmanica, Tenison-Woods.

1876. *Ampullaria tasmanica*, Tenison-Woods, Proc. Royal Soc., Tasmania, p. 117.

1881. *Amnicola tasmaniæ*, Tate and Brazier, Check List of the Fresh Water Shells of Australia, Proc. Linn. Soc., N.S.W., vol. vi., p. 563.

1888. *Brazieria* (non Ancey, 1887) *tasmanica*, Petterd, Proc. Royal Soc., Tasmania, p. 76, pl. 1, fig. 1.

1890. *Brazieria* (non Ancey, 1887), Petterd; Johnston, Proc. Royal Soc., Tasmania, p. 80.

1890. *Amnicola ? (Brazieria) tasmanica*, Tenison-Woods *(Amnicola)*, Johnston, l.c., p. 138, No. 304.

Hab. Abundant upon stones in a small tributary of the Arthur River, west of Mount Bischoff. (Messrs. James Smith, W. F. Petterd, R. M. Johnston.)

SOME ADDITIONS TO THE MOSS FLORA OF TASMANIA.

By W. A. Weymouth.

Part II.

(Read November 25th, 1895.)

In continuing the subject opened by me in the proceedings for 1893, I desire to acknowledge my further indebtedness to Professor V. F. Brotherus, of Helsingfors, from whose third series of "New Species of Australasian Mosses," as published in *Oefversight af Finska Vet.-Soc. Foerh*, Helsingfors, 1895, I obtain the descriptions of New Mosses given under the first following heading. It is a pleasure to call attention to the fact that the writer's name does not appear alone in connection with these new species, his friends, Mr. T. B. Moore, of Strahan, and the Rev. John Bufton, of Dunally, bearing him company. This portion of the paper adds fifteen (15) new species, making in all twenty-eight (28) new mosses since Mr. R. A. Bastow's list.

The second heading notes two new varieties. The third deals with mosses already known elsewhere, but now for the first time recorded for Tasmania. One of these, *Barbula rubella* (Hoffm.), Mitt., is of the more interest in that it is also thus first recorded for Australasia.

The fourth part gives descriptions of four new mosses the names only of which appeared in my 1893 paper. These are obtained from the sources in which the respective authors published their original descriptions.

NEW MOSSES.

14. *Sphagnum maximum*, Warnst., n. sp.

Hab.—Tasmania, locality unknown. (Herb. Mitten, No. 5.)

Writing to me on the 24th Jan., 1893, Mr. W. Mitten said:—"Packing material for apples from Tasmania supplied me with a Sphagnum, which I sent to Mr. Warnstorf, who said it was new."

On application to Mr. Warnstorf he was good enough to send me a small specimen of this moss, with the above name.

15. *Sphagnum moorei*, Warnst., n. sp.

Hab.—Kelly's Basin and Gordon River, Macquarie Harbour, on damp ground, 1893, T. B. Moore, No. 54. (Herb. W.A.W., No. 1602.)

16. *Andreæa amblyophylla*, C. Müll. in sched., n. sp.

Dioicous; in rigid, red-brown or black-brown cushions to 2 cm. high, easily falling to pieces. Stems erect, dichotomously branched; the branches fastigiate, obtuse, densely leaved. Leaves imbricate when dry, erecto-patent when wet, oblong-lanceolate or ovate-lanceolate, subcucullate, rotund-obtuse, coarsely papillose at back, nerveless, margin quite entire; cells very much thickened, the superior and marginal round, the middle narrow-oblong, and the basal linear. Perichaetial bracts much larger than the leaves, convolute, rotund-obtuse.

Hab.—On rocks, The Glen, Knocklofty, Hobart, W.A.W., Nos. 262, 475, 476, 477, 1618. (Also R. A. Bastow and A. J. Taylor in Herb. W.A.W., Nos. 1301, 1302.) Top Mount Wellington, W.A.W., Nos. 1634, 1635, 1643.

(Also New South Wales, Blue Mountains, T. H. Whitelegge, No. 302.)

Similar in habit to *A. petrophila*, Ehrh., but readily distinguished by the rotund-obtuse and subcucullate leaves.

17. *Dicranum rigens*, Burch. Broth., n. sp.

Hab.—On rock, Ploughed Field, Mount Wellington, 1891, and on log, Lauriston Gully, Kangaroo Point, 1889, W.A W., Nos. 767 and 160.

18. *Dicranum integerrimum*, Broth. Geh., n. sp.

Dioicous; in dense, pale yellow, somewhat shining tufts to 7 cm. high, for the most part buried in sand. Stem erect, densely leaved, sparingly radiculose. Leaves roughly patent, not at all subsecund, smooth at back, deeply canaliculate-concave, from an ovate-lanceolate base subulate, margins erect, connivent above, quite entire or having a few denticles at apex only; nerve very thin, indistinct at base, excurrent, with smooth back; cells everywhere elongate, narrowly linear; the marginal very narrow, hyaline, forming a somewhat wide border, the alar numerous, ventricose, fusco-aureate, all quite smooth. The rest unknown.

Hab.—Jones' Track, Sprent River, West Coast, on sandy button-grass plains, T. B. Moore, No. 58. (Herb. Sir F. von Mueller, and also W.A.W. No. 1563.)

"This moss," says Mr. Brotherus, "appears to be nearest to *D. angustinervis*, Mitt., which is known to me only by the description and figure. From that and other kindred species it is separated by the quite entire leaves."

19. *Dicranum eucamptodontoides*, Broth. Geh., n. sp.

Dioicous; robust. In rigid, dense, wide-spreading tufts, easily falling to pieces, for the most part buried in sand, fuscescent, the apex yellowish-green, shining. Stem to 7 cm. high, fragile, densely terete-leaved, sparingly radiculose, simple or branched; branches short, and shortly cuspidate. Leaves scariose, imbricate when dry, erect when wet, cymbiform-concave, ovate-oblong, shortly acuminate, 4—5 mm. long and 1·5—2 mm. wide, margins erect, connivent at apex, quite entire; nerve thin, indistinct at base, wider above, back prominent, smooth; cells elongate, narrow, porous between, the marginal very narrow, forming a narrow hyaline border, the basal fusco-aureate, the alar numerous, very incrassate, fusco-aureate, often discoloured, all quite smooth. Perichaetial bracts slightly exserted, longly vaginant, convolute, very obtuse; nerve indistinct. Seta, short, 1 cm. high, yellowish red, quite smooth. Calyptra cucullate, somewhat fuscous, apex rather scabrous, base truncate, entire.

Hab.—Jones' Track, Macquarie Harbour, on sandy button-grass hills, July 1893, T. B. Moore, No. 60. (Herb. Sir F. von Mueller, and also W.A.W. No. 1603.)

"This very remarkable species," says Mr. Brotherus, . . "I have classified, though indeed with much hesitation, among the genus *Dicranum*, because its very young fruit is somewhat curved, and the perichaetial leaves are much shorter than is the case with the species of the genus *Eucamptodon*."

20. *Pottia tasmanica*, Broth., n. sp.

Autoicous; gregarious, very small, fuscous-green. Stem scarcely 1 mm. high, radiculose at base, densely leaved, simple. Leaves when dry imbricate and indistinctly spirally twisted, when wet erect, strict, somewhat fleshy, concave, ovate-oblong or oblong, shortly acuminate or obtuse, muticous or very shortly cuspidate by the excurrent nerve, 0·95 mm. long and 0·38 mm. wide, margins strongly revolute (except at base); nerve rufescent, thin at base, thicker and better developed above, shortly excurrent; the marginal cells rectangular, hyaline, smooth, the upper rotund-hexagonal, c. 0·015 mm. in diameter, chlorophyllose, very papillose, obscure. Perichaetial bracts similar to the leaves. Seta 3 mm. high, yellow, very thin, quite smooth. Capsule erect, minute, oblong, fuscous, when dry somewhat shining, corrugated; exannulate. Peristome simple, pallid, rudimentary; teeth very short, 0·05—0·07 mm. high, truncate, very densely papillose; spores 0·025 mm., lutescent, coarsely pustular; operculum shortly conic, obtuse; calyptra fuscous at apex, scabrous.

Hab.—River Jordan, near Brighton, on earth, W.A.W., No. 1129.

21. *Glyphomitrium latifolium*, Broth., n. sp.

In somewhat dense tufts, easily falling to pieces, dark green, not at all shining. Stem to 2 cm. high, erect, flexuous, radiculose at base, densely leaved, simple or dichotomous. Leaves when dry crispate-appressed, when wet recurved-patulous, carinate-concave, from a scarcely dilated base oblong, rotund-obtuse, c. 3 mm. long and c. 0·85 mm. wide, margins erect, quite entire, slightly undulate; nerve rufescent, somewhat thick at base, gradually narrowing above, vanishing below the apex; cells rotund, c. 0·010 mm., the basal minute, quadrate, the intramarginal forming a lutescent border composed of from 4—5 series of rectangular cells, the intralimbate smaller, rectangular, less incrassate. The rest unknown.

Hab.—New Town Rivulet, on water-washed rocky bank, W.A.W. Nos. 1484, 1891, 1896.

"A very distinct species," says Mr. Brotherus, "readily distinguished by the form of the leaves."

22. *Macromitrium* (*Goniostoma*) *weymouthi*, Broth., n. sp.

Slender, prostrate, interwoven, bright-green, finally ferruginous. Stem longly creeping, vaguely branched; branches crowded with short, straight, or somewhat curved branchlets, densely leaved. Leaves when dry appressed, incurved at apex, spirally twisted, when wet erecto-patent, oblong-lanceolate, acute, the lower margins more or less revolute, quite entire. Nerve lutescent, vanishing below the apex; the basal cells elongate, very incrassate, and their cavities very narrow, those above the middle of leaf rotund, very incrassate, their cavities very minute, all pellucid and quite smooth. Perichaetial bracts erect, larger, acuminate. Seta erect, curvate-flexous, 8—15 mm. high, yellow, quite smooth; capsule erect, oval, plicate when empty, small mouth, dull brown; peristome simple, the teeth arising below the orifice, short, papillose; operculum rostrate, the beak scarcely more than half the length of the capsule; calyptra a sordid yellow, ferruginous at apex, glabrous.

Hab.—On wood, Porteus Gully, Queen River Road, Macquarie Harbour, and also Henty River, on branch of myrtle, 1891, W.A.W., Nos. 573-5, and 569.

"Nearest to *M. scottiæ*, C. Müll., but at once separated by the acute leaves, the vanishing nerve, and also the smaller cells."

23. *Macromitrium (Goniostoma) tasmanicum*, Broth., n.sp.

Autoicous; slender, prostrate, interwoven, bright green, when older fuscescent. Stem longly creeping, vaguely branched; branches crowded with short, straight branchlets,

densely leaved. Leaves when dry crispate-appressed, not twisted; when wet erecto-patent, oblong-lanceolate, acute, the lower margins more or less revolute, quite entire; nerve lutescent, vanishing below the apex; the basal cells elongate, very incrassate, and their cavities very narrow, those above the middle of the leaf rounded, all pellucid and quite smooth. Perichaetial bracts larger, erect, acuminate. Seta erect, flexuous, 5—7 mm. high, pale yellow-red, quite smooth; capsule erect, oval, plicate when empty, small mouth, dull brown; peristome simple, the teeth arising below the orifice short, papillose; operculum ? calyptra yellow, fuscous at apex, glabrous, plicate.

Hab.—On wood, South Road Forest, Circular Head, 1892, W.A.W., Nos. 846, 1040, 1041, and on Mount Wellington, No. 121 *(f. lutescens)*.

"Differs from the preceding species in the leaves being erect when dry, not spirally twisted; the less incrassate superior cells; and the shorter seta."

24. *Tayloria obtusissima*, Broth., n. sp.

Dioicous; in tall, dense tufts, interwoven with fuscous-purple tomentum, bright green, when young somewhat shining. Stem 9 cm. high, erect, loosely leaved, simple. Leaves roughly patulous, very concave, cucullate at apex, from a shortly spathulate base broadly ovate, subround-obtuse, 3—5 mm. long and 2·5 mm. wide; margins erect, minutely and obtusely serrulate above; nerve thin, lutescent, vanishing far below the apex; cells soft, lax, shortly and broadly oblong, the apical subrotund-hexagonal, the basal elongate, rectangular. Perichaetial bracts smaller, the margins of the inmost distinctly serrulate; nerve shorter; numerous archegonia. The rest unknown.

Hab.—Falls Track, Mount Wellington, March, 1891, W.A.W., No. 1797.

"A very fine and most distinct species, readily distinguished at a glance from *T. callophylla* (C. Müll.) by the very obtuse leaves."

25. *Calyptothecium buftoni*, Broth. Geh., n. sp.

Dioicous; fuscescent-green, shining. Stem creeping; branches to 10 c.m. long, flexuous, turgidly leaved, terete, obtuse, crowded with patent, terete, obtuse branchlets scarcely longer than 1 c.m., and turgidly leaved. Leaves when dry loosely imbricate, neither rugulose nor plicate, when wet patent, cymbiform, concave, oblong-oval, abruptly and shortly acuminate, margins erect, quite entire; nerveless; cells elongate, very narrow, chlorophyllose, the basal aureate,

all quite smooth. Perichaetial bracts pallid, larger, erect, longly acuminate. Capsule immersed, broadly oval, pallidly fuscous, smooth. The rest unknown.

Hab. — Bathurst Harbour, West Coast, Rev. John Bufton, No. 91 (Herb. Sir F. von Mueller), and track to Hartz Mountains, No. 17.

"A very distinct and beautiful species, at once distinguished from congeners by the branches being crowded with branchlets."

26. *Hypnum (Rhynchostegium) moorei*, Broth. Geh., n. sp.

Dioicous; in dense, very broad, rigid tufts, bright or sordid green, somewhat shining. Stem elongate, vaguely branched; branches elongate, robust, terete, densely and squamosely leaved. Leaves scariose, when wet erecto-patent, concave, ovate, acute, margins erect, everywhere minutely serrulate; nerve from a wider base thinly vanishing above the middle; cells very narrowly linear, somewhat flexuous, chlorophyllose, the basal shorter and wider, the alar indistinct. The internal perichaetial bracts erect, somewhat reflexed at apex, from a vaginant base narrowly acuminate, the margins remotely serrulate at apex, loosely reticulate; nerveless. Seta 17 mm. high, somewhat straight, red, everywhere rough; capsule subhorizontal, from a short neck ventricose-oblong, pachydermous, pallid, smooth; peristome double, the outer teeth c. 0·66 mm. long and c. 0·08 mm. wide, rufescent, hyaline at apex, scabrid; the inner teeth yellow, papillose; the processes carinate, broadly perforate; the cilia in triplets, short, hyaline; spores 0.012—0.015 mm., ochraceous, quite smooth; operculum with an oblique beak shorter than the capsule.

Hab.—On rocks in running water, Guy Fawkes Rivulet (Hobart), the South George River (Gould's Country), and Deep Creek, Mt. Wellington, W.A.W., Nos. 945, 1608, and 1822. Moore's Track to Frenchman's Cap, West Coast, T. B. Moore, No. 39 (Herbs. Sir F. von Mueller and W.A.W.)

"A most distinct species, similar in habit to *H. rusciformi*, Weiss, but sharply marked off from it by the rough seta."

27. *Stereodon nelsoni*, Broth., n. sp.

Dioicous; in somewhat loose tufts, bright green, when old somewhat pallidly fuscous, shining. Stem firm, elongate, flexuous, loosely leaved, pinnately branched; the branches patulous, short and simple, or longer, and with few branchlets, distichously leaved. Leaves scariose, sparingly homomallous, rather concave, patulous, ovate or oblong-ovate, shortly and broadly acuminate, rather obtuse, margins erect, very minutely serrulate, the apex finely serrulate; two short

nerves; cells elongate, very narrow, somewhat flexuous, the lowest basal shortened, aureate, the alar numerous, minute, very incrassate, all quite smooth. The rest unknown.

Hab.—On wood, The Den, Mount Nelson, 1890, male plant, W.A.W., No. 506.

"A very distinct species; related to *St. chrysogaster* (C. Müll.), but easily distinguished by the form of the leaves."

28. *Fissidens sarcophyllus*, Burch. Broth., n. sp.

Hab.—On face of rock, on track below the Springs, Mt. Wellington, 1891, W.A.W., No. 772.

NEW VARIETIES.

1. *Orthotrichum lateciliatum*, Vent., var. *apiculatum*, Vent., n. var.

Hab.—On rock, Hobart Rivulet, 1892, W.A.W., No. 1548.

2. *Ulota lutea*, Mitt., var. *glaucescens*, Vent., n.v.

Hab.—On wood, McRobie's Gully, Hobart, 1892, W.A.W., No. 1532.

MOSSES NEW TO TASMANIA.*

26. *Ditrichum flavipes*, C. Müll.

Hab.—On earth banks, Cradoc-road, Huon, and Forestier's Peninsula, 1889, W.A.W., Nos. 156, 162, 179, 258.

27. *Barbula rubella* (Hoffm.), Mitt.

Paroicous and synoicous; caespitose, deep green above' ferruginous red below, slender, branched. Leaves curled when dry, patent and recurved when moist, the lower lanceolate, upper suddenly larger, from an erect concave base, lineal-lanceolate, acuminate, carinate, minutely papillose on both sides, the margin recurved; nerve terete, vanishing below or in the apex; cells at base pellucid, rectangular, above small quadrate and chlorophyllose. Perichaetial bracts longly sheathing, thin. Capsule erect on a long reddish seta, cylindraceous, rarely oblong or oval, leptodermous, pale brownish-green, finally reddish; annulus of two rows of large cells, very fragile; lid conic, with a short straight or slightly oblique beak; peristome on a short basal membrane, pale red, soft, of 16 flat linear teeth, rarely cleft or perforated, the articulations nodose and papillose. Antheridia usually naked in the axils of the perichaetial bracts. *Barbula*

* That is, not recorded in Fl. Tasm., in Mitten's list of 1859 (Jnl. Linn. Soc. iv.), inMitten's AustralianCatalogue 1882, or in Bastow's Tasmanian mosses 1886.

rubella varies considerably in size and density, but is very uniform in the fruit, and always more or less red in the lower leaves.—Braithwaite's *British Moss Flora*, Vol. 1, p. 260.

Hab.—On a dead log, Lauriston Gully, Kangaroo Point, 1891, and on rocks, Hobart Rivulet, 1892, and New Town Rivulet, 1893, W.A.W., Nos. 711, 1220, 1485.

A European moss, not before recorded for Australasia.

28. *Entosthodon cuspidatus* (H.*f*.W.).—Fl. N.Z. ii. 91, t. 86, f. 3.

Stems $\frac{1}{8}$in. high. Leaves spreading, nearly flat, ovate, acuminate, quite entire, nerve far excurrent. Seta pale, 1in. long. Capsule erect, pyriform, small, quite symmetrical; annulus 0; inner peristome imperfect; operculum nearly flat.—Hook. *Handbook N. Z. Fl.*, p. 450 (Funaria).

Hab.—On the ground, Carlton, 1889, W.A.W., No. 428.

(Also New Zealand, Bay of Islands, J. D. Hooker.)

29. *Philonotis fertilis*, Mitten, Kew Journ. Bot. viii., p. 260.

Hab.—Ben Lomond, 1886, E. J. De Bomford. (Herbs. Bastow and Taylor; W.A.W., No. 1304.)

30. *Bartramia strictifolia*, Tayl.

Stems an inch high, laxly tufted, erect, subsimple, at the base clothed with a dark-brown down, in the middle reddish-brown, at the tops glaucescent-green. Leaves imbricate, strict, subulate-setaceous, subserrulate, margin reflexed, the lower appressed, straight, the upper recurved. Seta slender, flexuous, above an inch long. Capsule erect, from a narrow base subglobose, striate, when young turbinate, inclined to one side; operculum convex, obtusely mamillate; inner peristome much shorter than the outer.—*Lond. Journ. Bot.* 1846, p. 54.

Hab.—On the ground, Bay View Paddock, Bellerive, 1889, W.A.W., No. 967 (var. *minor*).

31. *Brachymenium preissianum*, Hampe, Icones, p. 25.

Hab.—On face of stone wall, Garden Crescent Reservoir, Hobart, 1890, W.A.W., No. 502.

(Also West Australia, Preiss, Drummond; and Victoria, F.V.M.)

32. *Bryum creberrimum*, Tayl. Lond. Journ. Bot. 1846, p. 54. —Fl. N. Z. ii. 84.—Hook. Hand. N.Z. Fl. p. 442.

Dioicous; stems aggregate, reddish, erect, with long shoots. Leaves olive-green, lax, suberect, when dry erect,

twisted and flexuous, lanceolate, acuminate, somewhat keeled, margin subrecurved, quite entire; nerve slender, excurrent as a very fine hair-point. Seta long, slender, flexuous; capsule nodding or pendulous, long, slender, cylindric, narrowed into the slender apophysis; operculum convex, mamillate.

"This differs," says Dr. Taylor, "from *Br. obconicum*, Br. Schimp., by the more elongated sterile shoots and their narrower leaves, and by the longer capsules, which are by no means obconical, but from a shrunken narrow apophysis are cylindrical."

Hab.—On the ground, near Richmond, 1888, and on wet bank, The Nut, Circular Head, 1892, W.A.W., Nos. 44 and 1068.

(Also West Australia and New Zealand.)

33. *Bryum erythrocarpoides*, Hampe and C. Müll., Linnæa 1853, p. 495.

Hab.—On wet earth bank, "Gentle Annie," Hobart Waterworks, 1892, W.A.W., No. 1216.

(Also Australia, F. v. M.)

34. *Bryum breviramulosum*, Hampe, Linnæa 1876, p. 311.

Hab.—On old log, Millhouse's Falls, Huon-road, 1893, W.A.W., No. 1467.

(Also Victoria, Sullivan.)

35. *Bryum pyrothecium*, Hampe and C. Müll., Linnæa 1855, p. 205.

Hab.—Bower Track, Mount Wellington, 1885, and Bay View Paddock, Bellerive, 1886, A. J. Taylor. On the ground, Fingal, and Guy Fawkes Rivulet, Hobart, 1888; on rocks near the Springs, Mount Wellington, 1890; and on the ground near Rocky Cape and at South-road Forest, Circular Head, 1892, W.A.W., Nos. 58, 94, 493, 541, 1063, 1076, 1078, and 1079.

(Also Australia.)

36. *Mniadelphus rotundifolius* (H.*f*.W.). Lond. Journ. Bot. 1844, p. 551.—Fl. N.Z. ii., p. 122, t. 93, f. 1.—Hook. Hand. N.Z. Fl., p. 493.—*Syn.*—*M. obliquo-mucronatus*, C. Müll. in litt.

Dioicous; small. Stem prostrate, $\frac{1}{4}$—$\frac{1}{2}$in. long, sparingly branched; branches compressed, slender, reddish. Leaves dark green, lax, spreading, crisped when dry, orbicular-ovate, apiculate; margin thickened, toothed; nerve reaching halfway; cells large, lax, hexagonal. Perichaetial bracts margined,

toothed. Seta slender, ¼in. long, smooth. Capsule horizontal, narrow-oblong, pale; operculum with a slender straight beak, nearly as long as the capsule. Teeth of peristome yellow, with two rather distant subcylindrical dorsal ridges, forming the external lamina of the tooth; inner peristome without cilia; processes carinate, perforated. Calyptra fimbriate at the base, subpilose at apex.

"Closely allied to *M. dicksoni*, Hook., but differs in the smaller, roundish, denticulate leaves, more shortly apiculate. From *M. crispula*, H.*f.* W., which it also much resembles, it is distinguished by the rounder, much smaller, and denticulate leaves, with larger and more uniform areolæ."—Hooker.

Hab.—On logs, Sassafras Gully and Bower Creek, Mt. Wellington, 1888; and on wet wood and stones, Hobart Rivulet, 1893, W.A.W., Nos. 373, 376, 1585, 1586. On logs, Sophia Point and Gordon River, Macquarie Harbour, 1893, T. B. Moore, Nos. 27 and 53.

37. *Meteorium* (*Pilotrichella*) *billardieri*, Hampe, Linnæa, 1859-60, p. 637 (Neckera).

Stems turgid, elongate, pendulous, irregularly branched; branches short, about an inch, turgid, somewhat obtuse. Leaves turgidly imbricate, from a cordate base, cochleariform (inflexed at base and apex), quite entire; nerves two, short, distant. Perichaetial bracts few, lanceolate, involute. Seta short, thick. Capsule short, ovate; operculum conic, obtuse; teeth of peristome red. "Differs from *Neckera molle*," says Hampe, "in the more robust habit, the double-nerved leaves, and obtuse operculum."

Mr. T. W. Naylor Beckett, of Christchurch, says:—"The leaves are often nerveless, as in *Pilotrichella molle*, and I was unable to detect any nerve in the leaves of the specimen in Herb. Helms identified by Dr. Müller. The very robust habit, the turgid foliage, and the more obtuse and blunter ramuli form the most distinctive characters."—*Trans. N.Z. Inst.* 1893, p. 285.

Hab.—On trees, Macquarie Harbour, 1893, T. B. Moore, No. 9. Columba Falls, South George River, 1894, W.A.W., No. 1607.

(Also found in Victoria and New Zealand.)

38. *Hypnum* (*Rhynchostegium*) *convolutifolium*, Hampe, Linnæa 1859, p. 641.

Syn.—*Amblystegium convolutifolium* (Hampe), Mitt. Austral. mosses, p. 39. *Rhynchostegium strictiusculum*, Broth., in Bailey Cont. Queensland Fl. iv., p. 21 (name only).

Hab.—River Mersey, near Latrobe Waterworks, on trunk of tree, W.A.W., No. 1492.

(Also Victoria, F.v.M., and Queensland, F. M. Bailey.)

Mr. Brotherus says (New Sp. Austral. Mosses iii., p. 67) that having had an opportunity of examining original specimens of *H. convolutifolium*, Hampe, kept in Lindberg's herbarium, he finds it to be a genuine *Rhynchostegium*,, and the Queensland moss, *H. strictiusculum*, Broth., to be perfectly identical with it.

39. *Polytrichum (Pogonatum) australasicum*, Hampe and C. Müll., Linnæa, 1853, p. 500.

Very like *P. tortile*, Swartz. Dioicous. Leaves from a subvaginant base short, pellucid, lanceolate, somewhat obtuse, somewhat plane, towards the apex spinulose-serrulate, spinulose at back, areolation sublax ; the comal leaves as the others ; all when dry intensely green ; nerve wide, and covered with numerous lamellæ almost to the apex of leaf. Capsule cylindric-oblong, subcernuous, fuscous, everywhere smooth ; operculum conic-apiculate, obtuse, short.

"The Australasian plant seems to be quite distinct from Swartz's *P. tortile* of the West Indies, being distinguished by its more obtuse leaves, its comal leaves being of the same form as the others, and particularly by its smooth cylindric capsule."—T. W. Naylor Beckett in *Trans. N.Z.*, 1893, p. 285.

Hab.—On shady earth banks, St. Crispin's Track, Mount Wellington, 1888, and Castra-road, Leven, 1892, W.A.W., Nos. 843 and 1057.

(Also found in Australia and New Zealand).

40. *Sphagnum antarcticum*, Mitt., Journ. Linn. Soc. IV. p. 100.

Hab.—On wet roadside bank, Longley, Huon-road, 1889 and 1892, and on Snake Plains, Mt. Wellington, 1894, W.A.W., Nos. 202, 1142, and 1617.—At Long Bay, Channel, 1890, A. J. Taylor (Herb. W.A.W., No. 1376).

MOSSES PREVIOUSLY RECORDED, BUT WANTING DESCRIPTION.

Isopterygium acuminatum, Bosw., Journal of Botany, April, 1892. (Proc. Roy. Soc. Tasm., 1893, p. 204, name only.)

In loose, low, soft tufts, bright green and lutescent-green. Leaves distichously compressed, shining, ovate-lanceolate, elongate, piliform, acuminate, truncate at base, margins quite entire; nerve very short, scarcely apparent; cells narrow elongate, the basal dilated, sub-quadrate, yellow. Capsule oblong, horizontally inclined.

"A rather larger plant," adds Mr. Boswell, "than *I. tenerum* (Hypnum), Swartz, from the West Indies, the leaves rather wider, long and slenderly acuminate. Colour bright glossy-green and straw-yellow. The opercula have vanished; the peristome seems normal."

Sphagnum serrulatum, Warnst. Hedwigia 1893 Tab. I. f. 1a—1g. (Proc. Roy. Soc. Tasm. 1893, p. 204, name only).

Plant robust, dark-green (always ?), floating in water, resembling a strong *Sph. cuspidatum*, Ehrh., especially the variety *plumosum*, Nees.

Stem leaves large, isosceles-triangular, 1·37—1·50 mm. long, and at the base averaging 1·14 mm. wide, with a narrow rounded or truncate, toothed apex; both kinds of cells in the middle and lower parts, the hyaline narrow and tube-shaped, without fibres or pores, the apical cells usually only chlorophyllose, the marginal gradually narrower, and forming an unmarked-off border of equal width.

Branches usually four in a fascicle, two long, strong, pointed, loosely leaved, and two somewhat weaker, rigid. Leaves of the former very large, long, narrow lanceolate, 5—5·14 mm. long, and at the base 1·14 mm. wide, running out to a narrow, truncate, coarsely-toothed apex, the margins from below the middle upwards, especially towards the apex, almost spinosely toothed, not rolled up when dry, undulate, somewhat shining; hyaline cells absent, only thin-walled trapezoid or nearly quadrate green cells, full of chlorophyll granules, gradually narrower towards the margin until they form an unmarked-off border, of course without fibres or pores.

Hab.—In ditch, Zeehan Railway, West Coast, 1891, W.A.W., No. 622.

"This," says Mr. Warnstorf, "is a remarkable species of the cuspidate group, and is distinguished from all others known to me by the presence in the branch leaves of none but chlorophyllose cells, all trace of fibres or pores therefore being absent. With forms of *Sph. cuspidatum* living in water exclusively it frequently happens that the hyaline cells recede in favour of the green cells, but that they should be wholly wanting is probably a new biological phenomenon with *Sphagna*. Another peculiarity is that the borders of both stem and branch leaves are not marked off from the other cell structure."

Sphagnum pseudo-rufescens, Warnst., Hedwigia 1893, Tab. II. f. 5a—5l. (Proc. Roy. Soc. Tasm., 1893, p. 204, name only.)

Plant scarcely distinguishable in habit from a densely branched *Sph. rufescens* with reddish-brown comæ.

Stem weak; cuticular cells in 1—2 layers, wide, nearly quadratic, with thin walls; woody tissue yellowish or reddish. Stem leaves very large, tongue-shaped, 2·20 mm. long, and at the base 1 mm. wide, apex rounded and denticulate, the upper margins more or less rolled up (often on one side only), narrow border of equal width all round; the inner hyaline cells almost poreless, the outer with numerous pores in rows at the commissures, very fibrous, the fibre structure mostly interrupted above the base, but resumed in the basal cells.

Branch fascicles densely crowded. Branches 4-5 in a fascicle, 2—3 stronger, divergent, the rest weaker, pendent. Leaves large, ovate or ovate-lanceolate, 1·83—3·14 mm. long, and at the base 1—1·32 mm. wide, the apex somewhat truncate and coarsely toothed, the margins bordered by 3—4 layers of narrow cells and curled far downwards, when dry closely imbricate, rarely placed slightly towards one side, not shining. Hyaline cells, narrow, long, very fibrous, nearly poreless on the inner leaf surface, but with numerous small pores at the commissures on the outer surface, the pores being much larger towards the base. Chlorophyllose cells in transverse section barrel-shaped, thick walled, central, free.

Hab.—In bog, top Mount Wellington, 1888, W.A.W., Nos. 972-7.

"By the pore structure in the branch leaves," says Mr. Warnstorf, "this species is very close to *Sph. subsecundum*, Nees; whilst the large stem leaves, fibrous to the base and bordered narrowly all round, reminds one of *Sph. rufescens* and *Sph. obesum*, Wils."

Sphagnum macrocephalum, Warnst., Hedwigia 1893, Tab. II. f. 6a—6g. (Proc. Roy. Soc. Tasm. 1893, p. 204, name only.)

Plant very robust, bluish-green or tinged with brown; the short upper branches uniting in a thick globular coma; in habit resembling a strong *Sph. cymbifolium*, especially the var. *glaucescens*.

Cuticle of the thick stem in 3—4 layers of wide cells without fibres, but those of the external layers with a large opening on the topside; the woody tissue dark red, with narrow thick-walled cells.

Stem leaves large, 1·28 mm. long and at the base 1·14 mm. wide, tongue-shaped. Hyaline cells towards the margins and the apex divided by obliquely-running walls, and terminating (especially at the apex) in a wide hyaline border, in which, however, the walls appear to be absent; quite without fibres, but with large round pores in nearly all the cell-angles.

Branches usually five in a fascicle, two strong, divergent, the rest much weaker, softer, and shorter, and appressed to

stem. Cuticular cells of both in one layer, only here and there a cell is divided lengthways. Leaves of divergent branches large, up to 2·14 mm. long, and below the middle about 1 mm. wide, from a narrow base widening to the middle, then gradually narrowing to a wide, truncate, toothed, cap-shaped apex, closely imbricate or squarrose, when dry faintly shining; margins denticulate and bordered by 3—4 layers of narrow cells. Hyaline cells very fibrose, those on the upper half of the inner suface of leaf having medium-sized pores, especially where several cell angles meet; nearer the margins the pores are solitary and small, whilst the base is poreless; on the apical half of the outer surface pores very numerous in rows at the commissures, slightly ringed, round to half-round, medium to small, in the basal part only small angle pores. Chlorophyllose cells in section elliptic, central, enclosed by the hyaline cells on the inner surface, but free on the outer, where the walls are mostly smaller, strong, and thickened. Leaves of the pendent branches appressed, lanceolate, with hyaline border towards apex; areolation much laxer; on both surfaces the hyaline cells have numerous much larger, delicately ringed, pores. Chlorophyllose cells trigonous-oval, nearer the outer surface, and here free, but enclosed at the inner surface by the hyaline cells.

Hab.—On the ground, Lake Bellinger Track, Zeehan Railway, West Coast, 1891, W.A.W., Nos. 623-4.

Bryum (*Eubryum*) *sullivani*, C Müll. Brotherus's Australian Mosses, ii., p. 37. (Proc. Roy. Soc. Tasm., 1893, p. 208, name only.)

Dioicous; in dense, soft, turgescent tufts, sordid green, scarcely shining. Stem to 2 cm. high, erect, densely leaved, sparingly radiculose at base; innovations few, erect, strict, to 8 mm. high, densely leaved, rather acute. Leaves all nearly equal, when dry imbricate, when wet patent, soft, very concave, not decurrent, oblong, somewhat obtuse, 1·5—1·7 mm. long and 0·5—0·6 mm. wide, not quite entire, not limbate, margins erect, revolute at base on one side only; nerve stout, 0·06 wide near the base, lutescent, red at base, vanishing below the apex; cells in the middle of the leaf rhomboid-hexagonal, 0·050—0·060 mm. long and 0·010—0·015 mm. wide, the basil rectangular, the lowest inflated, purple. Perichaetial bracts ovate, acuminate, the innermost smaller, from a dilated base gradually acuminate. Seta to 13 mm. high, geniculate-ascending at base, cygneous at apex, thin, purple, not shining, not twisted when dry. Capsule pendulous, oblong, with short thick neck, when dry rugose, 2·25 mm. long and 1 mm. thick, symmetrical, not constricted below the mouth, purple, not shining; annulus broad, revolute; peristome as in *Br. alpinum*,

spores 0·012—0·015 mm., ochraceous, quite smooth; operculum convex-conic, acutely apiculate, pallid. Male plant unknown.

"Related," says Mr. Brotherus, "to *Br. alpinum* and *Br. muehlenbeckii*. It recedes from the former in the much laxer areolation of the leaves and the vanishing nerve; and is distinguished from the latter by the purple capsule with thick neck."

ABBREVIATIONS.

Broth.—Professor V. F. Brotherus, of Helsingfors, Finland.

Burch.—Dr. O. Burchard, of Hamburg.

Geh.—Mr. A. Geheeb, who is working with Professor Brotherus on Baron Sir F. von Mueller's mosses.

Mitt.—Mr. W. Mitten, of Hurstpierpoint, Sussex, England.

Vent.—Dr. G. Venturi, of Trento.

Warnst.—Mr. C. Warnstorf, of Neuruppin, Prussia.

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